

Trigonometrik Fonksiyalar Üçün Toplama Teoremi

1. $\operatorname{tg} \alpha = 0,3$ olarsa, $\operatorname{ctg} \alpha$ -ni tapın.

A) 0,3 B) 0,6 C) 3 **D) $\frac{10}{3}$** E) $\frac{10}{9}$

$$\operatorname{tg} \alpha \operatorname{ctg} \alpha = 1 \quad \operatorname{ctg} \alpha = \frac{1}{\operatorname{tg} \alpha} = \frac{1}{0,3} = \frac{10}{3}$$

2. Hesablayın: $\frac{\operatorname{tg} \frac{\pi}{12} + \operatorname{tg}(\frac{\pi}{3} - \frac{\pi}{12})}{1 - \operatorname{tg} \frac{\pi}{12} \operatorname{tg}(\frac{\pi}{3} - \frac{\pi}{12})} = \operatorname{tg}(\frac{\pi}{12} + \frac{\pi}{3} - \frac{\pi}{12}) = \operatorname{tg} \frac{\pi}{3} = \sqrt{3}$

A) $\frac{1}{\sqrt{3}}$ B) $\frac{1}{\sqrt{2}}$ C) 1 D) $2\sqrt{3}$ **E) $\sqrt{3}$**

3. Hesablayın: $\frac{\operatorname{tg} 27^\circ + \operatorname{tg} 3^\circ}{1 - \operatorname{tg} 27^\circ \operatorname{tg} 3^\circ} = \operatorname{tg}(27^\circ + 3^\circ) = \operatorname{tg} 30^\circ = \frac{\sqrt{3}}{3}$

A) $\frac{\sqrt{3}}{3}$ B) $\sqrt{3}$ C) 1 D) $\sqrt{2}$ E) $-\frac{\sqrt{3}}{3}$

4. Hesablayın: $\sin 42^\circ \cos 12^\circ - \cos 42^\circ \sin 12^\circ = \sin(42^\circ - 12^\circ) =$

A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{\sqrt{2}}{2}$ D) 1 E) 0

$$= \sin 30^\circ = \frac{1}{2}$$

5. $\operatorname{tg} \alpha = 2$ olduqda $\operatorname{tg}(\alpha - \frac{\pi}{4})$ -i hesablayın.

A) $\frac{1}{3}$ B) 3 C) $\frac{2}{3}$ D) $\frac{3}{2}$ E) 4

$$\operatorname{tg}(\alpha - \frac{\pi}{4}) = \frac{\operatorname{tg} \alpha - \operatorname{tg} \frac{\pi}{4}}{1 + \operatorname{tg} \alpha \operatorname{tg} \frac{\pi}{4}} = \frac{2 - 1}{1 + 2 \cdot 1} = \frac{1}{3}$$

6. $\operatorname{tg} \alpha = -7$ olarsa, $\cos 2\alpha$ -ni hesablayın.

A) $-\frac{24}{25}$ B) $\frac{24}{25}$ C) $-\frac{4}{25}$ D) $-\frac{7}{25}$ E) $\frac{4}{25}$

$$\begin{aligned} \cos 2\alpha &= \frac{\cos^2 \alpha - \sin^2 \alpha}{\cos^2 \alpha + \sin^2 \alpha} = \frac{\frac{\cos^2 \alpha}{\cos^2 \alpha} - \frac{\sin^2 \alpha}{\cos^2 \alpha}}{\frac{\cos^2 \alpha}{\cos^2 \alpha} + \frac{\sin^2 \alpha}{\cos^2 \alpha}} = \frac{1 - \operatorname{tg}^2 \alpha}{1 + \operatorname{tg}^2 \alpha} \\ &= \frac{1 - (-7)^2}{1 + (-7)^2} = \frac{1 - 49}{1 + 49} = \frac{-48}{50} = -\frac{24}{25} \end{aligned}$$

7. $\operatorname{tg} \alpha = -7$ olarsa, $\sin 2\alpha$ -ni hesablayın.

A) $\frac{7}{25}$ **B) $-\frac{7}{25}$** C) 1 D) -1 E) $\frac{1}{25}$

$$\sin 2\alpha = \frac{2 \sin \alpha \cos \alpha}{\cos^2 \alpha + \sin^2 \alpha} = \frac{2 \sin \alpha \cos \alpha}{\frac{\cos^2 \alpha}{\cos^2 \alpha} + \frac{\sin^2 \alpha}{\cos^2 \alpha}} = \frac{2 \operatorname{tg} \alpha}{1 + \operatorname{tg}^2 \alpha} =$$

$$\text{CFR} = \frac{2 \cdot (-7)}{1 + (-7)^2} = \frac{-14}{1 + 49} = \frac{-14}{50} = -\frac{7}{25}$$

8. $\operatorname{tg} \alpha = -2$ olduqda $\operatorname{tg}(\alpha + \frac{\pi}{4})$ -i hesablayın.

A) $-\frac{1}{3}$ B) $\frac{1}{3}$ C) 3 D) -3 E) 2

$$\operatorname{tg}(\alpha + \frac{\pi}{4}) = \frac{\operatorname{tg} \alpha + \operatorname{tg} \frac{\pi}{4}}{1 - \operatorname{tg} \alpha \operatorname{tg} \frac{\pi}{4}} = \frac{-2 + 1}{1 - (-2) \cdot 1} = \frac{-1}{1 + 2} = -\frac{1}{3}$$

9. Hesablayın: $\frac{\operatorname{tg} 1^\circ + \operatorname{tg} 59^\circ}{1 - \operatorname{tg} 1^\circ \operatorname{tg} 59^\circ} = \operatorname{tg}(1^\circ + 59^\circ) = \operatorname{tg} 60^\circ = \sqrt{3}$

A) 1 B) $\frac{\sqrt{3}}{3}$ **C) $\sqrt{3}$** D) $-\sqrt{3}$ E) $\frac{1}{2}$

10. $\operatorname{tg} \alpha = 3$ olduqda $\operatorname{tg}(\frac{\pi}{4} + \alpha)$ -ni hesablayın.

A) 1 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ D) 2 **E) -2**

$$\operatorname{tg}(\frac{\pi}{4} + \alpha) = \frac{\operatorname{tg} \frac{\pi}{4} + \operatorname{tg} \alpha}{1 + \operatorname{tg} \frac{\pi}{4} \operatorname{tg} \alpha} = \frac{1 + 3}{1 + 1 \cdot 3} = \frac{4}{-2} = -2$$

11. Hesablayın: $\frac{\operatorname{tg} 72^\circ - \operatorname{tg} 12^\circ}{1 + \operatorname{tg} 72^\circ \operatorname{tg} 12^\circ} = \operatorname{tg}(72^\circ - 12^\circ) = \operatorname{tg} 60^\circ = \sqrt{3}$

A) $\sqrt{3}$ B) $\frac{1}{\sqrt{3}}$ C) 1 D) 0 E) $\sqrt{2}$

12. Hesablayın: $\sin 115^\circ \cdot \cos 55^\circ - \sin 55^\circ \cdot \cos 115^\circ =$

A) $\frac{1}{2}$ B) $\sin 20^\circ$ **C) $\frac{\sqrt{3}}{2}$** D) $\cos 20^\circ$ E) 1

$$= \sin(115^\circ - 55^\circ) = \sin 60^\circ = \frac{\sqrt{3}}{2}$$

13. Hesablayın: $\cos 25^\circ \cdot \cos 35^\circ - \sin 25^\circ \cdot \sin 35^\circ =$

A) $\frac{\sqrt{3}}{2}$ B) 1 C) $\frac{1}{\sqrt{2}}$ D) 0 E) $\frac{1}{2}$

$$= \cos(25^\circ + 35^\circ) = \cos 60^\circ = \frac{1}{2}$$

14. Hesablayın: $\frac{\operatorname{tg} 46^\circ - \operatorname{tg} 1^\circ}{1 + \operatorname{tg} 46^\circ \operatorname{tg} 1^\circ} = \operatorname{tg}(46^\circ - 1^\circ) = \operatorname{tg} 45^\circ = 1$

A) 1 B) $\sqrt{3}$ C) $-\sqrt{3}$ D) -1 E) $\sqrt{2}$

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15. Hesablayın: $\sin^2 22^\circ 30' - \cos^2 22^\circ 30' = -(\cos^2 22^\circ 30' - \sin^2 22^\circ 30')$
 A) $\sqrt{2}$ B) $-\frac{1}{2}$ C) $\frac{1}{2}$ **D) $-\frac{\sqrt{2}}{2}$** E) $\frac{\sqrt{2}}{2}$
 $= -\cos 2 \cdot 22^\circ 30' = -\cos 45^\circ = -\frac{\sqrt{2}}{2}$
16. Hesablayın: $\cos^2 15^\circ - \sin^2 15^\circ = \cos 2 \cdot 15^\circ = \cos 30^\circ = \frac{\sqrt{3}}{2}$
A) $\frac{\sqrt{3}}{2}$ B) $\frac{1}{2}$ C) $2\sqrt{2}$ D) $\frac{\sqrt{2}}{2}$ E) 1
17. Hesablayın: $2 \sin 22^\circ 30' \cdot \cos 22^\circ 30' = \sin 2 \cdot 22^\circ 30' = \sin 45^\circ = \frac{\sqrt{2}}{2}$
 A) $\frac{1}{2}$ B) 1 C) $\frac{\sqrt{3}}{2}$ **D) $\frac{\sqrt{2}}{2}$** E) $\frac{\sqrt{3}}{3}$
18. Hesablayın: $\frac{\operatorname{tg} \frac{7\pi}{12} - \operatorname{tg} \frac{\pi}{4}}{1 + \operatorname{tg} \frac{7\pi}{12} \operatorname{tg} \frac{\pi}{4}} = \operatorname{tg} \left(\frac{7\pi}{12} - \frac{\pi}{4} \right) = \operatorname{tg} \frac{7\pi - 3\pi}{12} = \operatorname{tg} \frac{4\pi}{12} =$
A) $\sqrt{3}$ B) $\sqrt{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{\sqrt{3}}{3}$ E) 1
 $= \operatorname{tg} \frac{\pi}{3} = \sqrt{3}$
19. Hesablayın: $\frac{2 \operatorname{tg} 15^\circ}{1 - \operatorname{tg}^2 15^\circ} = \operatorname{tg} 2 \cdot 15^\circ = \operatorname{tg} 30^\circ = \frac{1}{\sqrt{3}}$
 A) $\sqrt{3}$ **B) $\frac{1}{\sqrt{3}}$** C) $\frac{1}{2}$ D) 1 E) $\frac{1}{\sqrt{2}}$
20. Hesablayın: $\frac{\operatorname{tg} 30^\circ + \operatorname{tg} 15^\circ}{1 - \operatorname{tg} 30^\circ \operatorname{tg} 15^\circ} = \operatorname{tg} (30^\circ + 15^\circ) = \operatorname{tg} 45^\circ = 1$
A) 1 B) -1 C) $\sqrt{3}$ D) $-\sqrt{3}$ E) $\frac{1}{\sqrt{3}}$
21. Hesablayın: $\cos^2 75^\circ - \sin^2 75^\circ = \cos 2 \cdot 75^\circ = \cos 150^\circ =$
A) $-\frac{\sqrt{3}}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{1}{2}$ D) $-\frac{1}{2}$ E) 0
 $= \cos (180^\circ - 30^\circ) = -\cos 30^\circ = -\frac{\sqrt{3}}{2}$
22. Hesablayın: $\cos^2 165^\circ - \sin^2 165^\circ = \cos 2 \cdot 165^\circ = \cos 330^\circ =$
 A) $-\frac{\sqrt{3}}{2}$ **B) $\frac{\sqrt{3}}{2}$** C) $\frac{1}{2}$ D) $-\frac{1}{2}$ E) 0
 $= \cos (360^\circ - 30^\circ) = \cos 30^\circ = \frac{\sqrt{3}}{2}$
23. Hesablayın: $\cos 71^\circ \cos 11^\circ + \sin 71^\circ \sin 11^\circ = \cos (71^\circ - 11^\circ) =$
A) $\frac{1}{2}$ B) $\frac{\sqrt{2}}{2}$ C) 1 D) $-\frac{1}{2}$ E) 0
 $= \cos 60^\circ = \frac{1}{2}$
24. Aşağıdaki düsturlardan hansı doğrudur?
 - A) $1 + \operatorname{tg}^2 x = \frac{1}{\cos x}$ - B) $1 + \operatorname{ctg}^2 x = \frac{1}{\cos x}$ - C) $\operatorname{tg} 2x = \frac{1 - \operatorname{tg}^2 x}{2 \operatorname{tg} x}$
D) $2 \cos^2 x = 1 + \cos 2x$ - E) $\sin^2 \frac{x}{2} = \frac{1 + \cos x}{2}$
 A) $1 + \operatorname{tg}^2 x = \frac{1}{\cos^2 x}$ B) $1 + \operatorname{ctg}^2 x = \frac{1}{\cos^2 x}$ C) $\operatorname{tg} 2x = \frac{2 \operatorname{tg} x}{1 - \operatorname{tg}^2 x}$
 D) $\cos 2x = \cos^2 x - \sin^2 x$ E) $\sin^2 \frac{x}{2} = \frac{1 - \cos x}{2}$
 $\cos 2x = \cos^2 x - (1 - \cos^2 x)$
 $\cos 2x = 2 \cos^2 x - 1$
 $2 \cos^2 x = 1 + \cos 2x$ ✓
25. Aşağıdaki düsturlardan hansı səhvdir?
 A) $\sin \alpha + \sin \beta = 2 \sin \frac{\alpha + \beta}{2} \cos \frac{\alpha - \beta}{2}$ +
 B) $\sin \alpha - \sin \beta = 2 \sin \frac{\alpha - \beta}{2} \cos \frac{\alpha + \beta}{2}$ +
C) $\cos \alpha + \cos \beta = 2 \sin \frac{\alpha + \beta}{2} \sin \frac{\alpha - \beta}{2}$ -
 D) $\cos \alpha \cos \beta = \frac{1}{2} (\cos (\alpha - \beta) + \cos (\alpha + \beta))$ +
 E) $\sin \alpha \cos \beta = \frac{1}{2} (\sin (\alpha - \beta) + \sin (\alpha + \beta))$ +
 C) $\cos \alpha + \cos \beta = 2 \cos \frac{\alpha + \beta}{2} \cdot \cos \frac{\alpha - \beta}{2}$ olmalıdır!
26. Hesablayın: $\sin \frac{\pi}{12} + \sin \frac{5\pi}{12} = 2 \sin \frac{\frac{\pi}{12} + \frac{5\pi}{12}}{2} \cos \frac{\frac{\pi}{12} - \frac{5\pi}{12}}{2} =$
 A) 1 B) $\frac{\sqrt{3}}{2}$ C) $\frac{\sqrt{2}}{2}$ **D) $\frac{\sqrt{6}}{2}$** E) $\sqrt{2}$
 $= 2 \sin \frac{6\pi}{24} \cdot \cos \frac{-4\pi}{24} = 2 \sin \frac{\pi}{4} \cos \frac{\pi}{6} = 2 \cdot \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} = \frac{\sqrt{6}}{2}$
27. $\alpha = \frac{\pi}{3}$ olduqda $\frac{1 - \cos \alpha}{2 \sin \frac{\alpha}{2}}$ ifadəsinin qiymətini tapın.
A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{\sqrt{2}}{2}$ D) $\frac{\sqrt{6}}{2}$ E) $\sqrt{2}$
 $\frac{1 - \cos \frac{\pi}{3}}{2 \sin \frac{\pi}{6}} = \frac{1 - \frac{1}{2}}{2 \cdot \frac{1}{2}} = \frac{\frac{1}{2}}{1} = \frac{1}{2}$
 $\frac{1 - \cos \alpha}{2 \sin \frac{\alpha}{2}} = \frac{1 - \cos 2 \cdot \frac{\alpha}{2}}{2 \sin \frac{\alpha}{2}} = \frac{1 - \cos^2 \frac{\alpha}{2} + \sin^2 \frac{\alpha}{2}}{2 \sin \frac{\alpha}{2}} = \frac{2 \sin^2 \frac{\alpha}{2}}{2 \sin \frac{\alpha}{2}} = \sin \frac{\alpha}{2} =$
 $= \sin \frac{\pi}{6} = \sin \frac{6\pi}{6} = \frac{1}{2}$

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28. Hesablayın: $\cos^2 \frac{\pi}{8} - \sin^2 \frac{\pi}{8} = \cos 2 \cdot \frac{\pi}{8} = \cos \frac{\pi}{4} = \frac{\sqrt{2}}{2}$
 A) $-\frac{\sqrt{2}}{2}$ B) $\frac{\sqrt{2}}{2}$ C) $-\frac{\sqrt{2}}{2}$ **D) $\frac{\sqrt{2}}{2}$** E) $\frac{\sqrt{2}}{4}$

29. Hesablayın: $\frac{\cos 74^\circ \cdot \sin 40^\circ - \sin 74^\circ \cdot \cos 40^\circ}{\sin 34^\circ} = \frac{-\sin(74^\circ - 40^\circ)}{\sin 34^\circ} =$
 A) $\frac{1}{2}$ **B) -1** C) 1 D) $-\frac{1}{2}$ E) 0
 $= \frac{-\sin 34^\circ}{\sin 34^\circ} = -1$

30. Hesablayın: $\frac{\sin 85^\circ \cdot \sin 22^\circ - \cos 85^\circ \cdot \cos 22^\circ}{2 \cos 73^\circ} = \frac{-\cos(85^\circ + 22^\circ)}{2 \cos 73^\circ} =$
A) $\frac{1}{2}$ B) $-\frac{1}{2}$ C) $\frac{\sqrt{3}}{2}$ D) $-\frac{\sqrt{3}}{2}$ E) $\frac{\sqrt{2}}{2}$
 $= \frac{-\cos 107^\circ}{2 \cos 73^\circ} = \frac{-\cos(180^\circ - 73^\circ)}{2 \cos 73^\circ} = \frac{\cos 73^\circ}{2 \cos 73^\circ} = \frac{1}{2}$

31. Hesablayın: $(\cos \frac{5\pi}{6} \cdot \sin(-\frac{\pi}{6}))^2 = (\cos(\pi - \frac{\pi}{6}) \cdot (-\sin \frac{\pi}{6}))^2 =$
A) $\frac{3}{16}$ B) $\frac{5}{16}$ C) $\frac{3}{8}$ D) 1 E) $\frac{3}{4}$
 $= (-\cos \frac{\pi}{6} \cdot (-\sin \frac{\pi}{6}))^2 = (\cos \frac{\pi}{6} \cdot \sin \frac{\pi}{6})^2 = (\frac{\sqrt{3}}{2} \cdot \frac{1}{2})^2 = (\frac{\sqrt{3}}{4})^2 = \frac{3}{16}$

32. Hesablayın: $\frac{\sin 16^\circ \cdot \sin 74^\circ}{\sin 32^\circ} = \frac{\sin 16^\circ \cdot \sin(90^\circ - 16^\circ)}{\sin 2 \cdot 16^\circ} = \frac{\sin 16^\circ \cdot \cos 16^\circ}{2 \sin 16^\circ \cdot \cos 16^\circ} = \frac{1}{2}$
A) $\frac{1}{2}$ B) 2 C) $\frac{1}{3}$ D) $\frac{\sqrt{2}}{2}$ E) 1

33. Hesablayın: $\frac{\sin 68^\circ \cdot \cos 27^\circ - \sin 27^\circ \cdot \cos 68^\circ}{\sin 41^\circ} = \frac{\sin(68^\circ - 27^\circ)}{\sin 41^\circ} =$
A) 1 B) -1 C) 0 D) 2 E) -2
 $= \frac{\sin 41^\circ}{\sin 41^\circ} = 1$

34. İfademi sadeleştirin: $\frac{1 - \cos \alpha}{2 \sin \frac{\alpha}{2}} = \frac{1 - \cos \frac{\alpha}{2} + \sin^2 \frac{\alpha}{2}}{2 \sin \frac{\alpha}{2}} = \frac{2 \sin^2 \frac{\alpha}{2}}{2 \sin \frac{\alpha}{2}} = \sin \frac{\alpha}{2}$
A) $\sin \frac{\alpha}{2}$ B) $2 \cos \frac{\alpha}{2}$ C) $\cos \frac{\alpha}{2}$ D) 1 E) $\operatorname{tg} \frac{\alpha}{2}$

35. $\cos \alpha = \frac{1}{2}$ ve $0 < \alpha < \frac{\pi}{2}$ -dir. $\operatorname{tg} \frac{\alpha}{2}$ -ni hesaplayın.
 A) $\sqrt{3}$ B) $-\sqrt{2}$ **C) $\frac{\sqrt{3}}{3}$** D) $-\frac{\sqrt{3}}{3}$ E) 3

$$\operatorname{tg} \frac{\alpha}{2} = \sqrt{\frac{1 - \cos \alpha}{1 + \cos \alpha}} = \sqrt{\frac{1 - \frac{1}{2}}{1 + \frac{1}{2}}} = \sqrt{\frac{\frac{1}{2}}{\frac{3}{2}}} = \sqrt{\frac{1}{3}} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

36. İfademi sadeleştirin: $\cos(\alpha - \beta) - \cos \alpha \cos \beta =$
 A) $\cos(\alpha + \beta)$ B) $\cos \alpha \cos \beta$ **C) $\sin \alpha \sin \beta$**
 D) $\sin(\alpha - \beta)$ E) $\sin(\alpha + \beta)$

$$= \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta - \cos \alpha \cos \beta = \sin \alpha \sin \beta$$

37. İfademi sadeleştirin: $\sin \alpha \cos \beta - \sin(\alpha - \beta) =$
 A) $\cos(\alpha + \beta)$ B) $\sin(\alpha + \beta)$ **C) $\cos \alpha \sin \beta$**
 D) $2 \sin \alpha \cos \beta$ E) $\sin \alpha \sin \beta$

$$= \sin \alpha \cos \beta - \sin \alpha \cos \beta + \cos \alpha \sin \beta = \cos \alpha \sin \beta$$

38. $\operatorname{ctg} \alpha = \frac{2}{3}$ olduğunu bilerek, $\operatorname{tg}(\alpha - 45^\circ)$ -ni hesaplayın.
 A) $\frac{3}{2} - \frac{\pi}{4}$ B) $\frac{3}{2} + \frac{\pi}{4}$ C) $\frac{3}{2}$ D) 3 **E) $\frac{1}{5}$**

$$\operatorname{tg}(\alpha - 45^\circ) = \frac{\operatorname{tg} \alpha - \operatorname{tg} 45^\circ}{1 + \operatorname{tg} \alpha \cdot \operatorname{tg} 45^\circ} = \frac{\frac{2}{3} - 1}{1 + \frac{2}{3} \cdot 1} = \frac{-\frac{1}{3}}{\frac{5}{3}} = -\frac{1}{5}$$

$$\operatorname{ctg} \alpha = \frac{2}{3} \quad \operatorname{tg} \alpha = \frac{3}{2}$$

39. Hesablayın: $\cos^2 5^\circ - \frac{1}{2} \cos 10^\circ =$

A) $\frac{1}{2}$ B) 1 C) 2 D) $\cos 10^\circ$ E) 0
 $= \frac{1 + \cos 10^\circ}{2} - \frac{1}{2} \cos 10^\circ = \frac{1 + \cos 10^\circ - \cos 10^\circ}{2} = \frac{1}{2}$

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40. Hesablayın: $\frac{\cos 36^\circ}{2 \operatorname{tg} 27^\circ \cdot \sin^2 63^\circ} =$

- (A) 1 B) $\frac{1}{2}$ C) 2 D) $\sin 36^\circ$ E) $\operatorname{tg} 36^\circ$

$$= \frac{\cos 36^\circ}{2 \frac{\sin 27^\circ}{\cos 27^\circ} \cdot \cos^2 27^\circ} = \frac{\cos 36^\circ}{2 \sin 27^\circ \cos 27^\circ} = \frac{\cos 36^\circ}{\sin 54^\circ} = 1$$

41. Hesablayın: $\frac{\sin 28^\circ + \sin 32^\circ}{\sin 45^\circ (\sin 43^\circ + \sin 47^\circ)} =$

- (A) 1 B) $\sqrt{2}$ C) $\frac{1}{2}$ D) $\frac{1}{2}$ E) $\frac{1}{\sqrt{2}}$

$$= \frac{2 \sin 30^\circ \cos 2^\circ}{\sqrt{2} \sin 45^\circ \cos 2^\circ} = \frac{2 \cdot \frac{1}{2}}{\sqrt{2} \cdot \frac{1}{\sqrt{2}}} = 1$$

42. Hesablayın: $\frac{\cos 46^\circ \cos 29^\circ - \sin 46^\circ \sin 29^\circ}{\cos 75^\circ} =$

- (A) 1 B) $\frac{1}{2}$ C) $\sin 15^\circ$ D) 0 E) 2

$$= \frac{\cos (46^\circ + 29^\circ)}{\cos 75^\circ} = \frac{\cos 75^\circ}{\cos 75^\circ} = 1$$

43. Hesablayın: $\frac{\cos 15^\circ \sin 20^\circ - \cos 20^\circ \sin 15^\circ}{2 \sin 5^\circ} =$

- A) $\frac{1}{2}$ B) 1 C) 2 D) 0 E) $\cos 5^\circ$

$$= \frac{\sin (20^\circ - 15^\circ)}{2 \sin 5^\circ} = \frac{\sin 5^\circ}{2 \sin 5^\circ} = \frac{1}{2}$$

44. Hesablayın: $\sin 12^\circ \cos 18^\circ + \sin 18^\circ \cos 12^\circ = \sin (12^\circ + 18^\circ) =$

- A) $\frac{\sqrt{3}}{2}$ B) $\frac{\sqrt{2}}{2}$ C) 0 D) $-\frac{\sqrt{3}}{2}$ E) $\frac{1}{2}$

$$= \sin 30^\circ = \frac{1}{2}$$

45. $\cos 15^\circ$ -ni hesablayın.

- A) $\frac{1}{4}$ B) $\frac{\sqrt{6} + \sqrt{2}}{4}$ C) $\frac{\sqrt{6} - \sqrt{2}}{4}$ D) $\frac{\sqrt{2}}{4}$ E) $-\frac{\sqrt{2}}{4}$

$$\cos 15^\circ = \cos (60^\circ - 45^\circ) = \cos 60^\circ \cos 45^\circ + \sin 60^\circ \sin 45^\circ = \frac{1}{2} \cdot \frac{\sqrt{2}}{2} + \frac{\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} = \frac{\sqrt{2}}{4} + \frac{\sqrt{6}}{4} = \frac{\sqrt{2} + \sqrt{6}}{4}$$

$$\cos 15^\circ = \sqrt{\frac{1 + \cos 30^\circ}{2}} = \sqrt{\frac{1 + \frac{\sqrt{3}}{2}}{2}} = \sqrt{\frac{2 + \sqrt{3}}{4}} = \frac{\sqrt{2 + \sqrt{3}}}{2} = \frac{\sqrt{4 + 2\sqrt{3}}}{2\sqrt{2}} = \frac{\sqrt{(\sqrt{3} + 1)^2}}{2\sqrt{2}} = \frac{\sqrt{3} + 1}{2\sqrt{2}} = \frac{\sqrt{6} + \sqrt{2}}{4}$$

CFR

46. $\sin 75^\circ$ -ni hesablayın.

- A) 0,75 B) $\frac{\sqrt{2}}{4}$ C) $\frac{\sqrt{6} + \sqrt{2}}{4}$ D) $\frac{\sqrt{6} - \sqrt{2}}{4}$ E) $-\frac{\sqrt{2}}{4}$

$$\sin 75^\circ = \cos 15^\circ = \frac{\sqrt{6} + \sqrt{2}}{4}$$

$$\sin 75^\circ = \sin (30^\circ + 45^\circ) = \dots$$

47. Hesablayın: $2 \sin 15^\circ \sin 75^\circ = 2 \sin 15^\circ \cos 15^\circ = \sin 30^\circ = \frac{1}{2} = 0,5$

- A) 1 B) $-\frac{1}{2}$ C) 0 D) 0,5 E) 1

48. Hesablayın: $2 \cos^2 15^\circ - 1 = 2 \cdot \frac{1 + \cos 30^\circ}{2} - 1 = 1 + \cos 30^\circ - 1 =$

- A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{\sqrt{2}}{2}$ D) 1 E) $\frac{1}{3}$

$$= \cos 30^\circ = \frac{\sqrt{3}}{2}$$

49. $\sin \alpha = \frac{\sqrt{3}}{2}$ və $0^\circ < \alpha < 90^\circ$ olduqda $\sin (30^\circ + \alpha)$ ifadəsinin qiymətini hesablayın

- A) $\frac{1}{4}$ B) $\frac{3}{4}$ C) $\frac{1}{2}$ D) -1 E) 1

$$\left. \begin{array}{l} \sin \alpha = \frac{\sqrt{3}}{2} \\ \alpha \in I \end{array} \right\} \Rightarrow \alpha = 60^\circ \quad \sin (30^\circ + 60^\circ) = \sin 90^\circ = 1$$

50. Hesablayın: $2 \cos 15^\circ \cos 75^\circ = 2 \cos 15^\circ \sin 15^\circ = \sin 30^\circ = \frac{1}{2} = 0,5$

- A) $\frac{1}{2}$ B) 0,5 C) 0 D) 1 E) $\frac{1}{4}$

51. İfadəni sadələşdirin: $\frac{1 + \cos 2\alpha}{\cos \alpha} = \frac{1 + \cos^2 \alpha - \sin^2 \alpha}{\cos \alpha} = \frac{2 \cos^2 \alpha}{\cos \alpha} = 2 \cos \alpha$

- A) $\cos \alpha$ B) $\sin \alpha$ C) $2 \cos \alpha$ D) $2 \sin \alpha$ E) $\operatorname{tg} \alpha$

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52. $\alpha = \frac{2\pi}{3}$ olduqda $\frac{1+\cos \alpha}{2 \cos \frac{\alpha}{2}}$ ifadəsinin qiymətini hesablayın.

- A) 1 B) $\frac{\sqrt{3}}{2}$ C) $\frac{\sqrt{2}}{2}$ **(D) $\frac{1}{2}$** E) -1

$$\begin{aligned} \frac{1+\cos \alpha}{2 \cos \frac{\alpha}{2}} &= \frac{1+\cos \frac{2\pi}{3}}{2 \cos \frac{\pi}{3}} = \frac{1+\cos \frac{2\pi}{3}-\sin^2 \frac{\pi}{3}}{2 \cos \frac{\pi}{3}} = \frac{2 \cos^2 \frac{\pi}{3}}{2 \cos \frac{\pi}{3}} = \cos \frac{\pi}{3} = \cos \frac{2\pi}{3} = \\ &= \cos \frac{2\pi}{3} = \cos \frac{\pi}{3} = \frac{1}{2} \end{aligned}$$

53. $y = \sin x \cos x$ funksiyasının ən böyük qiymətini tapın.

- (A) 0,5** B) 1 C) -0,5 D) 2 E) 1,5

$$y = \sin x \cos x = \frac{1}{2} \cdot 2 \sin x \cos x = \frac{1}{2} \sin 2x$$

$-1 \leq \sin 2x \leq 1$

$$\text{ƏBQ } |y| = \frac{1}{2} \cdot 1 = \frac{1}{2} = 0,5$$

54. Sadələşdirin: $2 \sin \left(\frac{\pi}{2} - \alpha\right) \sin(\pi - \alpha) - \sin 2\alpha =$

- A) $-2 \sin 2\alpha$ B) 0 C) $\sin 2\alpha$ D) $2 \sin 2\alpha$ E) 1

$$= 2 \cos \alpha \cdot \sin \alpha - \sin 2\alpha = \sin 2\alpha - \sin 2\alpha = 0$$

55. Sadələşdirin: $\sin^2 \left(\frac{3\pi}{2} + \alpha\right) - \cos^2 \left(\frac{\pi}{2} + \alpha\right) - \cos 2\alpha =$

- A) $2 \cos 2\alpha$ B) $-2 \cos 2\alpha$ C) $\cos 2\alpha$ D) 1 **(E) 0**

$$= \cos^2 \alpha - \sin^2 \alpha - \cos 2\alpha = \cos 2\alpha - \cos 2\alpha = 0$$

56. Hesablayın: $\cos 20^\circ + \cos 100^\circ + \cos 140^\circ =$

- A) 1 **(B) 0** C) 60 D) 0,6 E) 0,8

$$\begin{aligned} &= 2 \cos \frac{20^\circ+100^\circ}{2} \cdot \cos \frac{20^\circ-100^\circ}{2} + \cos 140^\circ = \\ &= 2 \cos 60^\circ \cdot \cos 40^\circ + \cos(180^\circ-40^\circ) = 2 \cdot \frac{1}{2} \cdot \cos 40^\circ - \cos 40^\circ = \\ &= \cos 40^\circ - \cos 40^\circ = 0 \end{aligned}$$

57. Hesablayın: $\cos 73^\circ + \cos 47^\circ - \cos 13^\circ =$

- A) $2 \cos 17^\circ$ **(B) 0** C) $(\sqrt{3}-1) \cos 13^\circ$ D) $\frac{1}{2}$ E) 1

$$\begin{aligned} &= 2 \cos \frac{73^\circ+47^\circ}{2} \cdot \cos \frac{73^\circ-47^\circ}{2} - \cos 13^\circ = \\ &= 2 \cos 60^\circ \cdot \cos 13^\circ - \cos 13^\circ = 2 \cdot \frac{1}{2} \cdot \cos 13^\circ - \cos 13^\circ = 0 \end{aligned}$$

58. Sadələşdirin: $\sin \left(\frac{3\pi}{2} + \alpha\right) \cos(\alpha - 3\pi) \operatorname{ctg} \left(\frac{5\pi}{2} + \alpha\right) =$

- (A) $-\frac{1}{2} \sin 2\alpha$** B) $\frac{1}{2} \sin 2\alpha$ C) $-\frac{1}{2} \cdot \frac{\cos^3 \alpha}{\sin \alpha}$
D) $\cos^2 \alpha$ E) $-\cos^2 \alpha \cdot \sin \alpha$

$$\begin{aligned} &= -\cos \alpha \cdot (-\cos \alpha) \cdot (-\operatorname{tg} \alpha) = -\cos^2 \alpha \cdot \frac{\sin \alpha}{\cos \alpha} = -\sin \alpha \cos \alpha = \\ &= -\frac{1}{2} \cdot 2 \sin \alpha \cdot \cos \alpha = -\frac{1}{2} \sin 2\alpha \end{aligned}$$

59. Hesablayın: $1 - 2 \sin^2 15^\circ = 1 - 2 \cdot \frac{1 - \cos 30^\circ}{2} = 1 - 1 + \cos 30^\circ =$

- A) $\frac{1}{2}$ B) $\frac{1}{2}$ C) $\frac{\sqrt{2}}{2}$ **(D) $\frac{\sqrt{3}}{2}$** E) 1

$$= \cos 30^\circ = \frac{\sqrt{3}}{2}$$

60. $\operatorname{tg} = 5$ olarsa, $\operatorname{tg}(\alpha + 45^\circ)$ -ni tapın.

- A) $\frac{3}{2}$ **(B) $-\frac{3}{2}$** C) $\frac{2}{3}$ D) $-\frac{2}{3}$ E) 2

$$\operatorname{tg}(\alpha + 45^\circ) = \frac{\operatorname{tg} \alpha + \operatorname{tg} 45^\circ}{1 - \operatorname{tg} \alpha \cdot \operatorname{tg} 45^\circ} = \frac{5 + 1}{1 - 5 \cdot 1} = \frac{6}{-4} = -\frac{3}{2}$$

61. $\operatorname{tg} = 3$ olarsa, $\operatorname{tg}(\alpha - 45^\circ)$ -ni tapın.

- A) -2 B) $-\frac{1}{2}$ **(C) $\frac{1}{2}$** D) $\frac{1}{4}$ E) 2

$$\operatorname{tg}(\alpha - 45^\circ) = \frac{\operatorname{tg} \alpha - \operatorname{tg} 45^\circ}{1 + \operatorname{tg} \alpha \cdot \operatorname{tg} 45^\circ} = \frac{3 - 1}{1 + 3 \cdot 1} = \frac{2}{4} = \frac{1}{2}$$

62. Hesablayın: $\cos 13^\circ \cos 35^\circ + \cos 77^\circ \cos 55^\circ - \cos 22^\circ =$

- (A) 0** B) $\frac{1}{2}$ C) $\sqrt{2}$ D) $\sqrt{3}$ E) 1

$$\begin{aligned} &= \cos 13^\circ \cos 35^\circ + \sin 13^\circ \sin 35^\circ - \cos 22^\circ = \\ &= \cos(35^\circ - 13^\circ) - \cos 22^\circ = \cos 22^\circ - \cos 22^\circ = 0 \end{aligned}$$

63. Hesablayın: $\frac{\sin 20^\circ \cos 20^\circ}{\cos 50^\circ} = \frac{2 \sin 20^\circ \cos 20^\circ}{2 \cos 50^\circ} =$

- A) 1 B) -1 **(C) $\frac{1}{2}$** D) $-\frac{1}{2}$ E) $\frac{1}{4}$

$$= \frac{\sin 40^\circ}{2 \cdot \sin 40^\circ} = \frac{1}{2}$$

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64. İfadənin qiymətini tapın: $\sin 51^\circ \cos 21^\circ - \cos 51^\circ \sin 21^\circ =$
 A) $\sin 72^\circ$ **B) $\frac{1}{2}$** C) $\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{2}}{2}$ E) 1
 $= \sin(51^\circ - 21^\circ) = \sin 30^\circ = \frac{1}{2}$

65. İfadənin qiymətini tapın: $\cos 107^\circ \cos 17^\circ + \sin 107^\circ \sin 17^\circ =$
 A) 1 B) -1 **C) 0** D) $\frac{\sqrt{2}}{2}$ E) $\cos 124^\circ$
 $= \cos(107^\circ - 17^\circ) = \cos 90^\circ = 0$

66. İfadənin qiymətini tapın: $\cos 72^\circ \cdot \cos 216^\circ =$
 A) $-\frac{1}{2}$ B) $-\frac{\sqrt{2}}{2}$ C) $-\frac{\sqrt{3}}{3}$ **D) $-\frac{1}{4}$** E) $-\frac{3}{4}$
 $= \cos(90^\circ - 18^\circ) \cdot \cos(180^\circ + 36^\circ) = \sin 18^\circ (-\cos 36^\circ) =$
 $= -\frac{2 \sin 18^\circ \cos 36^\circ}{2 \cos 18^\circ} = -\frac{2 \sin 36^\circ \cos 36^\circ}{2 \cos 18^\circ} = -\frac{\sin 72^\circ}{4 \sin 72^\circ} = -\frac{1}{4}$

67. Hesablayın: $\frac{2}{\frac{1}{\operatorname{tg} \frac{\pi}{8}} - \operatorname{tg} \frac{\pi}{8}} =$
 A) 2 **B) 1** C) $\frac{1}{2}$ D) $\sqrt{3}$ E) $\frac{\sqrt{2}}{2}$
 $= \frac{2}{\frac{1}{\frac{1-\operatorname{tg} \frac{\pi}{4}}{1+\operatorname{tg} \frac{\pi}{4}}} - \operatorname{tg} \frac{\pi}{8}} = \frac{2}{\frac{1+\operatorname{tg} \frac{\pi}{4}}{1-\operatorname{tg} \frac{\pi}{4}} - \operatorname{tg} \frac{\pi}{8}} = \frac{2}{\frac{1+\operatorname{tg} \frac{\pi}{4} - \operatorname{tg} \frac{\pi}{8}}{1-\operatorname{tg} \frac{\pi}{4}}} = \frac{2}{\frac{1+\operatorname{tg} \frac{\pi}{4} - \operatorname{tg} \frac{\pi}{8}}{1-\operatorname{tg} \frac{\pi}{4}}} = 1$

68. Hesablayın: $\cos 15^\circ \cdot \cos 105^\circ = \frac{1}{4} (\cos(15^\circ + 105^\circ) + \cos(105^\circ - 15^\circ)) =$
 A) 0,25 B) 0,5 **C) -0,25** D) -0,5 E) 1
 $= \frac{1}{2} (\cos 120^\circ + \cos 90^\circ) = \frac{1}{2} (\cos(180^\circ - 60^\circ) + 0) = \frac{1}{2} (-\cos 60^\circ) =$
 $= \frac{1}{2} (-\frac{1}{2}) = -\frac{1}{4} = -0,25$

69. Hesablayın: $2 \cos 20^\circ \cos 40^\circ - \cos 20^\circ =$
A) $\frac{1}{2}$ B) $\frac{\sqrt{2}}{2}$ C) $\frac{\sqrt{2}}{2}$ D) $-\frac{1}{2}$ E) $-\frac{\sqrt{2}}{2}$
 $= 2 \cdot \frac{1}{2} (\cos(20^\circ + 40^\circ) + \cos(40^\circ - 20^\circ)) - \cos 20^\circ = \cos 60^\circ + \cos 20^\circ - \cos 20^\circ =$
 $= \frac{1}{2}$

CFR

70. Hesablayın: $2 \sin 10^\circ \sin 40^\circ + \cos 50^\circ =$
A) $\frac{\sqrt{3}}{2}$ B) $\frac{1}{2}$ C) $-\frac{\sqrt{3}}{2}$ D) $-\frac{1}{2}$ E) $\frac{\sqrt{2}}{2}$
 $= 2 \cdot \frac{1}{2} (\cos(40^\circ + 10^\circ) - \cos(40^\circ - 10^\circ)) + \cos 50^\circ =$
 $= -1 (\cos 50^\circ - \cos 30^\circ) + \cos 50^\circ = -\cos 50^\circ + \frac{\sqrt{3}}{2} + \cos 50^\circ = \frac{\sqrt{3}}{2}$

71. İfadəni sadələşdirin:
 $\frac{2}{\sin 1^\circ} (\sin 87^\circ - \sin 59^\circ + \sin 61^\circ - \sin 93^\circ) =$
A) 2 B) 1 C) $\frac{1}{2}$ D) $2\sqrt{3}$ E) $2\sqrt{2}$
 $= \frac{2}{\sin 1^\circ} (\sin 87^\circ - \sin 93^\circ + \sin 61^\circ - \sin 59^\circ) =$
 $= \frac{2}{\sin 1^\circ} (2 \cos \frac{87^\circ + 93^\circ}{2} \sin \frac{87^\circ - 93^\circ}{2} + 2 \cos \frac{61^\circ + 59^\circ}{2} \sin \frac{61^\circ - 59^\circ}{2}) =$
 $= \frac{4}{\sin 1^\circ} (2 \cos 90^\circ \cdot \sin 3^\circ + 2 \cos 60^\circ \cdot \sin 1^\circ) = \frac{4}{\sin 1^\circ} (0 + 2 \cdot \frac{1}{2} \sin 1^\circ) =$
 $= \frac{4}{\sin 1^\circ} \cdot \sin 1^\circ = 4$

72. Sadələşdirin: $\frac{\sin 4\alpha}{\cos 5\alpha - \cos 3\alpha} =$
 A) $-\frac{1}{\sin \alpha}$ B) $\frac{1}{2 \sin \alpha}$ C) $-\frac{1}{2} \sin \alpha$
D) $-\frac{1}{2 \sin \alpha}$ E) $\frac{1}{2} \sin \alpha$
 $= \frac{\sin 4\alpha}{-2 \sin \frac{5\alpha + 3\alpha}{2} \sin \frac{5\alpha - 3\alpha}{2}} = \frac{\sin 4\alpha}{-2 \sin 4\alpha \cdot \sin \alpha} = -\frac{1}{2 \sin \alpha}$

73. Hesablayın: $\frac{\cos 15^\circ + \sin 15^\circ}{\cos 15^\circ - \sin 15^\circ} = \frac{\cos 15^\circ + \cos 75^\circ}{\cos 15^\circ - \cos 75^\circ} =$
 A) $\frac{1}{\sqrt{2}}$ B) 3 **C) $\sqrt{3}$** D) $\frac{1}{3}$ E) 2
 $= \frac{2 \cos \frac{15^\circ + 75^\circ}{2} \cdot \cos \frac{75^\circ - 15^\circ}{2}}{-2 \sin \frac{15^\circ + 75^\circ}{2} \cdot \sin \frac{75^\circ - 15^\circ}{2}} = \frac{\cos 45^\circ \cdot \cos 30^\circ}{-\sin 45^\circ \cdot \sin 30^\circ} = \operatorname{ctg} 30^\circ = \sqrt{3}$

74. Hesablayın: $\cos 20^\circ + \sin 20^\circ \cdot \operatorname{tg} 10^\circ =$
 A) 2 **B) 1** C) $\frac{\sqrt{2}-1}{2}$ D) $\frac{\sqrt{2}+1}{4}$ E) -1
 $= \cos 20^\circ + \sin 20^\circ \cdot \frac{\sin 10^\circ}{\cos 10^\circ} = \frac{\cos 20^\circ \cos 10^\circ + \sin 20^\circ \cdot \sin 10^\circ}{\cos 10^\circ} =$
 $= \frac{\cos(20^\circ - 10^\circ)}{\cos 10^\circ} = \frac{\cos 10^\circ}{\cos 10^\circ} = 1$

75. $\cos \frac{3\alpha}{2} \cdot \cos \frac{\alpha}{2} = \frac{1}{2}$ olduğunu bilərək $2 \cos^2 \alpha + \cos \alpha - 1 =$ ifadəsinin qiymətini tapın.
A) 1 B) $\frac{1}{4}$ C) 2 D) $\frac{1}{2}$ E) -2
 $= 2 \cdot \frac{1 + \cos 2\alpha}{2} + \cos \alpha - 1 = 1 + \cos 2\alpha + \cos \alpha - 1 =$
 $= \cos 2\alpha + \cos \alpha = 2 \cos \frac{2\alpha + \alpha}{2} \cdot \cos \frac{2\alpha - \alpha}{2} = 2 \cos \frac{3\alpha}{2} \cdot \cos \frac{\alpha}{2} =$
 $= 2 \cdot \frac{1}{2} = 1$

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76. Hesablayın: $\operatorname{ctg} 40^\circ \cos 10^\circ - \sin 10^\circ =$
 (A) 1 (B) 0 (C) -1 (D) $\operatorname{ctg} 10^\circ$ (E) $\cos 50^\circ$

$$= \frac{\cos 40^\circ}{\sin 40^\circ} \cdot \cos 10^\circ - \sin 10^\circ = \frac{\cos 40^\circ \cos 10^\circ - \sin 40^\circ \sin 10^\circ}{\sin 40^\circ} =$$

$$= \frac{\cos(40^\circ + 10^\circ)}{\sin 40^\circ} = \frac{\cos 50^\circ}{\cos 50^\circ} = 1$$

77. Hesablayın: $\sin 10^\circ + \operatorname{tg} 40^\circ \cos 10^\circ =$
 (A) 1 (B) 0 (C) -1 (D) $\operatorname{tg} 10^\circ$ (E) $\sin 50^\circ$

$$= \sin 10^\circ + \frac{\sin 40^\circ}{\cos 40^\circ} \cdot \cos 10^\circ = \frac{\sin 10^\circ \cos 40^\circ + \cos 10^\circ \sin 40^\circ}{\cos 40^\circ} =$$

$$= \frac{\sin(10^\circ + 40^\circ)}{\cos 40^\circ} = \frac{\sin 50^\circ}{\sin 50^\circ} = 1$$

78. $y = 2 - 3 \sin x$ funksiyanın qiymətər oblastını tapın.
 (A) $[-1; 5]$ (B) $[-4; 2]$ (C) $[-5; 1]$ (D) $[-2; 4]$ (E) $[-5; 5]$
 $-1 \leq \sin x \leq 1 \quad 2 - 3 \sin x = 2 - 3(-1) = 2 + 3 = 5 \quad \text{ƏBQ}$
 $2 - 3 \sin x = 2 - 3 \cdot 1 = 2 - 3 = -1 \quad \text{ƏKQ}$
 $[-1; 5]$

79. $\sin \alpha - \cos \alpha$ ifadəsinin ən kiçik qiymətini tapın.
 (A) -2 (B) $-\sqrt{2}$ (C) $-\sqrt{3}$ (D) -1,5 (E) -1
 $\sin \alpha - \cos \alpha = \sin \alpha - \sin(90^\circ - \alpha) = 2 \cos \frac{\alpha + 90^\circ - \alpha}{2} \cdot \sin \frac{\alpha - 90^\circ + \alpha}{2}$
 $= 2 \cos 45^\circ \sin(\alpha - 45^\circ) = 2 \cdot \frac{\sqrt{2}}{2} \cdot \sin(\alpha - 45^\circ) = \sqrt{2} \sin(\alpha - 45^\circ)$
 $\sin \alpha - \cos \alpha = \sqrt{2} \sin(\alpha - 45^\circ) = \sqrt{2} \cdot (-1) = -\sqrt{2} \quad \text{ƏKQ}$
 $-1 \leq \sin(\alpha - 45^\circ) \leq 1$

80. $\sin \alpha + \cos \alpha$ ifadəsinin ən böyük qiymətini tapın.
 (A) $\sqrt{2}$ (B) 1 (C) 2 (D) $-\frac{3}{2}$ (E) $\frac{1}{2}$
 $\sin \alpha + \cos \alpha = \sin \alpha + \sin(90^\circ - \alpha) = 2 \sin \frac{\alpha + 90^\circ - \alpha}{2} \cdot \cos \frac{\alpha - 90^\circ + \alpha}{2}$
 $= 2 \sin 45^\circ \cos(\alpha - 45^\circ) = 2 \cdot \frac{\sqrt{2}}{2} \cdot \cos(\alpha - 45^\circ) = \sqrt{2} \cos(\alpha - 45^\circ)$
 $\sin \alpha + \cos \alpha = \sqrt{2} \cos(\alpha - 45^\circ) = \sqrt{2} \cdot 1 = \sqrt{2} \quad \text{ƏBQ}$
 $-1 \leq \cos(\alpha - 45^\circ) \leq 1$

81. Hesablayın: $\frac{\sin 87^\circ - \sin 27^\circ}{\sin 33^\circ} = \frac{2 \cos \frac{87^\circ + 27^\circ}{2} \cdot \cos \frac{87^\circ - 27^\circ}{2}}{\sin 33^\circ} =$
 (A) -1 (B) 2 (C) 1 (D) -2 (E) $\sqrt{3}$
 $= \frac{2 \cos 57^\circ \cdot \cos 30^\circ}{\sin 33^\circ} = \frac{2 \sin 33^\circ \cdot \frac{\sqrt{3}}{2}}{\sin 33^\circ} = \sqrt{3}$

82. Hesablayın: $\frac{\cos 47^\circ + \cos 73^\circ}{\sin 77^\circ} = \frac{2 \cos \frac{47^\circ + 73^\circ}{2} \cdot \cos \frac{73^\circ - 47^\circ}{2}}{\sin 77^\circ} =$
 (A) 1 (B) -1 (C) 0 (D) 2 (E) $-\sqrt{3}$
 $= \frac{2 \cos 60^\circ \cdot \cos 13^\circ}{\cos 13^\circ} = 2 \cdot \frac{1}{2} = 1$

83. $\operatorname{tg}(45^\circ + \alpha) = 3$ olduğu məlumdur. $\operatorname{tg} \alpha$ -ni tapın.
 (A) $\frac{1}{3}$ (B) $\frac{1}{2}$ (C) 3 (D) 2 (E) -1

$$\operatorname{tg}(45^\circ + \alpha) = \frac{\operatorname{tg} 45^\circ + \operatorname{tg} \alpha}{1 - \operatorname{tg} 45^\circ \cdot \operatorname{tg} \alpha} = \frac{1 + \operatorname{tg} \alpha}{1 - \operatorname{tg} \alpha} = 3$$

$$1 + \operatorname{tg} \alpha = 3(1 - \operatorname{tg} \alpha)$$

$$1 + \operatorname{tg} \alpha = 3 - 3 \operatorname{tg} \alpha$$

$$\operatorname{tg} \alpha + 3 \operatorname{tg} \alpha = 3 - 1$$

$$4 \operatorname{tg} \alpha = 2 \Rightarrow \operatorname{tg} \alpha = \frac{2}{4} = \frac{1}{2}$$

84. $\operatorname{tg} \frac{\alpha}{2} = \sqrt{2} - 1$ və $\alpha \in (0; \frac{\pi}{2})$ olarsa, α bucağını tapın.
 (A) $\frac{\pi}{2}$ (B) $2(\sqrt{2} - 1)$ (C) $2\sqrt{2}$ (D) $\frac{\pi}{4}$ (E) $-\frac{\pi}{4}$
 $\operatorname{tg} \alpha = \operatorname{tg} 2 \cdot \frac{\alpha}{2} = \frac{2 \operatorname{tg} \frac{\alpha}{2}}{1 - \operatorname{tg}^2 \frac{\alpha}{2}} = \frac{2(\sqrt{2}-1)}{1 - (\sqrt{2}-1)^2} = \frac{2(\sqrt{2}-1)}{1 - (2 - 2\sqrt{2} + 1)} = \frac{2(\sqrt{2}-1)}{1 - 3 + 2\sqrt{2}} =$
 $= \frac{2(\sqrt{2}-1)}{2\sqrt{2}-2} = \frac{2(\sqrt{2}-1)}{2(\sqrt{2}-1)} = 1 \Rightarrow \operatorname{tg} \alpha = 1 \quad \alpha \in (0; \frac{\pi}{2})$
 $\alpha = \frac{\pi}{4}$

85. $\operatorname{tg}(\frac{\pi}{4} + \alpha) = 7$ olarsa, $\operatorname{tg} \alpha$ -ni tapın.
 (A) 7 (B) $\frac{1}{4}$ (C) 4 (D) $\frac{3}{4}$ (E) 3
 $\frac{\operatorname{tg} \frac{\pi}{4} + \operatorname{tg} \alpha}{1 - \operatorname{tg} \frac{\pi}{4} \cdot \operatorname{tg} \alpha} = \frac{1 + \operatorname{tg} \alpha}{1 - \operatorname{tg} \alpha} = 7$
 $1 + \operatorname{tg} \alpha = 7(1 - \operatorname{tg} \alpha)$
 $1 + \operatorname{tg} \alpha = 7 - 7 \operatorname{tg} \alpha$
 $\operatorname{tg} \alpha + 7 \operatorname{tg} \alpha = 7 - 1$
 $8 \operatorname{tg} \alpha = 6$
 $\operatorname{tg} \alpha = \frac{6}{8} = \frac{3}{4}$

86. $\operatorname{tg}(\frac{\pi}{4} - \alpha) = 5$ olarsa, $\operatorname{tg} \alpha$ -ni tapın.
 (A) $-\frac{2}{3}$ (B) $\frac{2}{3}$ (C) $\frac{3}{2}$ (D) $-\frac{3}{2}$ (E) -1
 $\frac{\operatorname{tg} \frac{\pi}{4} - \operatorname{tg} \alpha}{1 + \operatorname{tg} \frac{\pi}{4} \cdot \operatorname{tg} \alpha} = \frac{1 - \operatorname{tg} \alpha}{1 + \operatorname{tg} \alpha} = 5$
 $1 - \operatorname{tg} \alpha = 5(1 + \operatorname{tg} \alpha)$
 $1 - \operatorname{tg} \alpha = 5 + 5 \operatorname{tg} \alpha$
 $1 - 5 = 5 \operatorname{tg} \alpha + \operatorname{tg} \alpha$
 $8 \operatorname{tg} \alpha = -4$
 $\operatorname{tg} \alpha = \frac{-4}{8} = -\frac{1}{2}$

87. Sadələşdirin: $\frac{\operatorname{tg}(\frac{\pi}{4} + \alpha) - \operatorname{tg} \alpha}{1 + \operatorname{tg}(\frac{\pi}{4} + \alpha) \operatorname{tg} \alpha} = \operatorname{tg}(\frac{\pi}{4} + \alpha - \alpha) = \operatorname{tg} \frac{\pi}{4} = 1$
 (A) $1 - \operatorname{tg} \alpha$ (B) $\frac{1}{1 + \operatorname{tg} \alpha}$ (C) $1 + \operatorname{tg} \alpha$ (D) -1 (E) 1

88. $\operatorname{tg} \frac{\alpha}{2} = 2$ olduqda $\sin \alpha$ -ni hesablayın.
 (A) 1 (B) $\frac{1}{2}$ (C) $\frac{1}{5}$ (D) $\frac{4}{5}$ (E) $\frac{3}{5}$
 $\sin \alpha = \frac{2 \sin \frac{\alpha}{2} \cdot \cos \frac{\alpha}{2}}{\cos^2 \frac{\alpha}{2} + \sin^2 \frac{\alpha}{2}} = \frac{2 \sin \frac{\alpha}{2} \cdot \cos \frac{\alpha}{2}}{\frac{\cos^2 \frac{\alpha}{2}}{\cos^2 \frac{\alpha}{2}} + \frac{\sin^2 \frac{\alpha}{2}}{\cos^2 \frac{\alpha}{2}}} = \frac{2 \operatorname{tg} \frac{\alpha}{2}}{1 + \operatorname{tg}^2 \frac{\alpha}{2}} = \frac{2 \cdot 2}{1 + 2^2} = \frac{4}{5}$

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89. $tg \alpha = 2$ olduqda $\frac{\sin \alpha \cos \alpha}{\sin^2 \alpha - \cos^2 \alpha}$ ifadəsinin qiymətini tapın

- A) $\frac{3}{2}$ B) $-\frac{3}{2}$ C) 2 **D) $\frac{2}{3}$** E) $-\frac{2}{3}$

$$= \frac{\frac{\sin \alpha \cos \alpha}{\cos^2 \alpha}}{\frac{\sin^2 \alpha}{\cos^2 \alpha} - \frac{\cos^2 \alpha}{\cos^2 \alpha}} = \frac{tg \alpha}{tg^2 \alpha - 1} = \frac{2}{2^2 - 1} = \frac{2}{4 - 1} = \frac{2}{3}$$

90. Hesablayın: $tg^2 \frac{\pi}{8} = \frac{1 - \cos \frac{\pi}{4}}{1 + \cos \frac{\pi}{4}} = \frac{1 - \frac{1}{\sqrt{2}}}{1 + \frac{1}{\sqrt{2}}} = \frac{\sqrt{2} - 1}{\sqrt{2} + 1} = \frac{\sqrt{2} - 1}{\sqrt{2} + 1} =$

- A) $\frac{\sqrt{2}}{4}$ B) $\frac{1}{4}$ C) $3 + 2\sqrt{2}$ **D) $3 - 2\sqrt{2}$** E) 1

$$= \frac{(\sqrt{2} - 1)(\sqrt{2} - 1)}{(\sqrt{2} + 1)(\sqrt{2} - 1)} = \frac{(\sqrt{2} - 1)^2}{\sqrt{2}^2 - 1^2} = \frac{2 - 2\sqrt{2} + 1}{2 - 1} = 3 - 2\sqrt{2}$$

91. Hesablayın: $\arccos(2^{\log_4 3 - 1})$.

- A) $\frac{\pi}{4}$ B) $\frac{\pi}{3}$ **C) $\frac{\pi}{6}$** D) 0 E) $\frac{\pi}{2}$

$$2^{\log_4 3 - 1} = 2^{\log_2 \sqrt{3} - 1} = 2^{\log_2 \sqrt{3}} : 2^1 = \sqrt{3} : 2 = \frac{\sqrt{3}}{2}$$

$$\arccos(2^{\log_4 3 - 1}) = \arccos\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{6}$$

92. Hesablayın: $\arcsin(2^{\log_4 2 - 1})$.

- A) $\frac{\pi}{2}$ **B) $\frac{\pi}{4}$** C) 0 D) π E) $\frac{\pi}{3}$

$$2^{\log_4 2 - 1} = 2^{\log_2 \sqrt{2} - 1} = 2^{\log_2 \sqrt{2}} : 2^1 = \sqrt{2} : 2 = \frac{\sqrt{2}}{2}$$

$$\arcsin(2^{\log_4 2 - 1}) = \arcsin\left(\frac{\sqrt{2}}{2}\right) = \frac{\pi}{4}$$

93. Hesablayın: $\frac{\sqrt{3} \sin 20^\circ \operatorname{tg} 15^\circ}{2 \cos 70^\circ (1 - \operatorname{tg}^2 15^\circ)} = \frac{\sqrt{3} \sin 20^\circ \operatorname{tg} 15^\circ}{2 \sin 20^\circ (1 - \operatorname{tg}^2 15^\circ)} =$

- A) $\frac{1}{4}$** B) $\frac{1}{2}$ C) 1 D) $\sqrt{3}$ E) $\frac{1}{\sqrt{3}}$

$$= \frac{\sqrt{3} \cdot 2 \operatorname{tg} 15^\circ}{2 \cdot 2 (1 - \operatorname{tg}^2 15^\circ)} = \frac{\sqrt{3}}{4} \cdot \operatorname{tg} 2 \cdot 15^\circ = \frac{\sqrt{3}}{4} \cdot \operatorname{tg} 30^\circ = \frac{\sqrt{3}}{4} \cdot \frac{\sqrt{3}}{3} = \frac{3}{4 \cdot 3} = \frac{1}{4}$$

94. Hesablayın: $1 - 2 \sin^2\left(\frac{1}{2} \arccos \frac{5}{13}\right) =$

- A) $\frac{8}{13}$ **B) $\frac{5}{13}$** C) $-\frac{8}{13}$ D) $-\frac{5}{13}$ E) $\frac{12}{13}$

$$= 1 - 2 \cdot \frac{1 - \cos\left(2 \cdot \frac{1}{2} \arccos \frac{5}{13}\right)}{2} = 1 - 1 + \cos \arccos \frac{5}{13} = \frac{5}{13}$$

95. $\alpha = \frac{\pi}{8}$ olduqda $\frac{\sin 2\alpha}{\sin^2\left(\frac{\pi}{2} + \alpha\right) - \sin^2(\pi + \alpha)}$ ifadəsinin qiymətini

tapın

- A) -1 **B) 1** C) $\sqrt{3}$ D) $\sqrt{2}$ E) $-\frac{1}{2}$

$$= \frac{\sin 2\alpha}{\cos^2 \alpha - \sin^2 \alpha} = \frac{\sin 2\alpha}{\cos 2\alpha} = \operatorname{tg} 2\alpha = \operatorname{tg} 2 \cdot \frac{\pi}{8} = \operatorname{tg} \frac{\pi}{4} = 1$$

96. $\alpha = \frac{\pi}{12}$ olduqda $\frac{\cos^2(\alpha - \pi) - \cos^2\left(\frac{3\pi}{2} + \alpha\right)}{\sin 2\alpha}$ ifadəsinin qiymətini

tapın

- A) $\sqrt{3}$** B) $-\sqrt{3}$ C) 1 D) $-\frac{\sqrt{3}}{3}$ E) $\frac{\sqrt{3}}{3}$

$$= \frac{\cos^2 \alpha - \sin^2 \alpha}{\sin 2\alpha} = \frac{\cos 2\alpha}{\sin 2\alpha} = \operatorname{ctg} 2\alpha = \operatorname{ctg} 2 \cdot \frac{\pi}{12} = \operatorname{ctg} \frac{\pi}{6} = \sqrt{3}$$

97. $\frac{2 \sin 18^\circ \cos 18^\circ \cos 36^\circ}{2 \cos 18^\circ}$ ifadəsini hesablayın.

- A) $\frac{1}{4}$** B) $\frac{1}{2}$ C) $\frac{1}{8}$ D) 1 E) $\frac{1}{6}$

$$= \frac{2 \sin 36^\circ \cos 36^\circ}{2 \cos 18^\circ} = \frac{\sin 72^\circ}{4 \sin 42^\circ} = \frac{1}{4}$$

98. Hesablayın: $\operatorname{ctg}^2 \frac{\pi}{8} =$

- A) $3 + 2\sqrt{2}$** B) $\frac{1}{4}$ C) $\frac{\sqrt{2}}{2}$ D) 1 E) $3 - 2\sqrt{2}$

$$= \frac{1 + \cos \frac{\pi}{4}}{1 - \cos \frac{\pi}{4}} = \frac{1 + \frac{1}{\sqrt{2}}}{1 - \frac{1}{\sqrt{2}}} = \frac{\sqrt{2} + 1}{\sqrt{2} - 1} = \frac{\sqrt{2} + 1}{\sqrt{2} - 1} \cdot \frac{(\sqrt{2} + 1)}{(\sqrt{2} + 1)} = \frac{(\sqrt{2} + 1)^2}{\sqrt{2}^2 - 1^2} = \frac{2 + 2\sqrt{2} + 1}{2 - 1} = 3 + 2\sqrt{2}$$

99. Hesablayın: $\frac{1 + \operatorname{tg}^2 15^\circ}{1 - \operatorname{tg}^2 15^\circ} = \frac{1 + \frac{\sin^2 15^\circ}{\cos^2 15^\circ}}{1 - \frac{\sin^2 15^\circ}{\cos^2 15^\circ}} = \frac{\frac{\cos^2 15^\circ + \sin^2 15^\circ}{\cos^2 15^\circ}}{\frac{\cos^2 15^\circ - \sin^2 15^\circ}{\cos^2 15^\circ}} = \frac{1}{\cos 30^\circ} =$

- A) $-\sqrt{3}$ B) $\frac{1}{\sqrt{3}}$ **C) $\frac{2}{\sqrt{3}}$** D) $-\frac{2}{\sqrt{3}}$ E) 1

$$= \frac{1}{\cos 30^\circ} = \frac{1}{\frac{\sqrt{3}}{2}} = \frac{2}{\sqrt{3}}$$

$$\cos 2\alpha = \frac{\cos^2 \alpha - \sin^2 \alpha}{\cos^2 \alpha + \sin^2 \alpha} = \frac{\frac{\cos^2 \alpha}{\cos^2 \alpha} - \frac{\sin^2 \alpha}{\cos^2 \alpha}}{\frac{\cos^2 \alpha}{\cos^2 \alpha} + \frac{\sin^2 \alpha}{\cos^2 \alpha}} = \frac{1 - \operatorname{tg}^2 \alpha}{1 + \operatorname{tg}^2 \alpha}$$

100. Hesablayın: $\cos 3^\circ \cdot \cos 27^\circ \cdot \cos 60^\circ - \sin 3^\circ \cdot \sin 27^\circ \cdot \sin 30^\circ =$

- A) $\frac{\sqrt{3}}{4}$** B) $\frac{\sqrt{3}}{2}$ C) $\frac{1}{4}$ D) $\frac{1}{2}$ E) $\sqrt{3}$

$$= \frac{1}{2} \cos 3^\circ \cdot \cos 27^\circ - \frac{1}{2} \sin 3^\circ \cdot \sin 27^\circ =$$

$$= \frac{1}{2} (\cos 3^\circ \cos 27^\circ - \sin 3^\circ \sin 27^\circ) = \frac{1}{2} \cos (3^\circ + 27^\circ) = \frac{1}{2} \cos 30^\circ =$$

$$= \frac{1}{2} \cdot \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{4}$$

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101. Hesablayın:

$$\begin{aligned} & \sin 10^\circ \cdot \cos 80^\circ \cdot \cos 30^\circ + \cos 10^\circ \cdot \sin 60^\circ \cdot \sin 80^\circ = \\ & A) \frac{\sqrt{3}}{4} \quad B) \frac{3}{4} \quad C) \frac{1}{2} \quad \text{D) } \frac{\sqrt{3}}{2} \quad E) 1 \\ & = \frac{\sqrt{3}}{2} \sin 10^\circ \cos 80^\circ + \frac{\sqrt{3}}{2} \cos 10^\circ \sin 80^\circ = \\ & = \frac{\sqrt{3}}{2} (\sin 10^\circ \cos 80^\circ + \cos 10^\circ \sin 80^\circ) = \frac{\sqrt{3}}{2} \sin(10^\circ + 80^\circ) = \\ & = \frac{\sqrt{3}}{2} \sin 90^\circ = \frac{\sqrt{3}}{2} \cdot 1 = \frac{\sqrt{3}}{2}. \end{aligned}$$

102. Hesablayın: $\cos 24^\circ - \frac{\sin^2 24^\circ}{2 \sin^2 12^\circ} =$

$$\begin{aligned} & \text{A) } -1 \quad B) 1 \quad C) 0 \quad D) 2 \quad E) -2 \\ & = \cos 24^\circ - \frac{(\sin 2 \cdot 12^\circ)^2}{2 \sin^2 12^\circ} = \cos 24^\circ - \frac{(2 \sin 12^\circ \cos 12^\circ)^2}{2 \sin^2 12^\circ} = \\ & = \cos 24^\circ - \frac{4 \sin^2 12^\circ \cos^2 12^\circ}{2 \sin^2 12^\circ} = \cos 24^\circ - 2 \cos^2 12^\circ = \\ & = -\sin^2 12^\circ - \cos^2 12^\circ = -(\sin^2 12^\circ + \cos^2 12^\circ) = -1. \end{aligned}$$

103. Hesablayın: $\frac{\sin 12^\circ \sin 78^\circ}{\sin 24^\circ} = \frac{\sin 12^\circ \cos 12^\circ}{2 \sin 12^\circ \cos 12^\circ} = \frac{1}{2} = 0,5$

A) 0,1 B) 0,4 C) 0,5 D) 0,6 E) 0,8

104. $\frac{\cos 59^\circ - \cos 1^\circ}{\sin 59^\circ - \sin 1^\circ}$ ifadesini hesaplayın.

$$\begin{aligned} & A) \sqrt{3} \quad B) -\frac{1}{\sqrt{3}} \quad C) -1 \quad D) \frac{1}{2} \quad E) \frac{\sqrt{3}}{2} \\ & = \frac{-2 \sin \frac{59^\circ + 1^\circ}{2} \sin \frac{59^\circ - 1^\circ}{2}}{2 \cos \frac{59^\circ + 1^\circ}{2} \sin \frac{59^\circ - 1^\circ}{2}} = -\frac{\sin 30^\circ}{\cos 30^\circ} = -\text{tg } 30^\circ = -\frac{1}{\sqrt{3}} \end{aligned}$$

105. Hesablayın: $\frac{\cos 53^\circ - \cos 7^\circ}{\sin 53^\circ - \sin 7^\circ} = \frac{-2 \sin \frac{53^\circ + 7^\circ}{2} \sin \frac{53^\circ - 7^\circ}{2}}{2 \cos \frac{53^\circ + 7^\circ}{2} \sin \frac{53^\circ - 7^\circ}{2}} = -\frac{\sin 30^\circ}{\cos 30^\circ} = -\text{tg } 30^\circ = -\frac{1}{\sqrt{3}}$

A) $-\frac{1}{\sqrt{3}}$ B) $\frac{1}{\sqrt{3}}$ C) $\sqrt{3}$ D) $-\sqrt{3}$ E) 1

106. $\sin \alpha = 0,6$ və $90^\circ < \alpha < 180^\circ$ olduğunu bilərək, $\sin^2 \alpha / 2$ -ni tapın.

A) 0,8 B) 0,4 C) 0,9 D) 0,75 E) 0,5

$$\sin^2 \frac{\alpha}{2} = \frac{1 - \cos \alpha}{2} = \frac{1 - (-\sqrt{1 - \sin^2 \alpha})}{2} = \frac{1 + \sqrt{1 - 0,6^2}}{2} =$$

$$\text{CFR} = \frac{1 + 0,8}{2} = \frac{1,8}{2} = 0,9$$

107. İfadəni sadələşdirin: $\sin^2 \left(\frac{3}{4}\pi + \alpha \right) + \frac{1}{2} \sin 2\alpha =$

A) $\frac{1}{2}$ B) $-\frac{1}{2}$ C) $\sin 2\alpha$ D) $\cos 2\alpha$ E) 1

$$= \frac{1 - \cos \left(\frac{3\pi}{2} + 2\alpha \right)}{2} + \frac{\sin 2\alpha}{2} = \frac{1 - \sin 2\alpha + \sin 2\alpha}{2} = \frac{1}{2}$$

108. Hesablayın: $\frac{\sin^2 10^\circ}{2 \sin^2 5^\circ} - \cos 10^\circ = \frac{4 \sin^2 5^\circ \cos^2 5^\circ}{2 \sin^2 5^\circ} - \cos 10^\circ =$

A) 0,5 B) -1 C) 0 D) 1 E) $\frac{\sqrt{3}}{2}$

$$= 2 \cos^2 5^\circ - \cos^2 5^\circ + \sin^2 5^\circ = \cos^2 5^\circ + \sin^2 5^\circ = 1$$

109. Sadələşdirin: $\frac{2 \sin \alpha}{\text{tg} \alpha \sin^3 \alpha - \cos^3 \alpha} =$

A) $\text{ctg } 2\alpha$ B) $\sin 2\alpha$ C) $\cos 2\alpha$ D) $-\text{tg } 2\alpha$ E) $\text{tg } 2\alpha$

$$\begin{aligned} & = \frac{2 \sin \alpha}{\frac{\sin \alpha}{\cos \alpha} (\sin^3 \alpha - \cos^3 \alpha)} = \frac{2 \sin \alpha \cos \alpha}{\frac{\sin^3 \alpha - \cos^3 \alpha}{\cos \alpha}} = \frac{2 \sin \alpha \cos \alpha}{(\sin^2 \alpha - \cos^2 \alpha) \cos \alpha} = \\ & = \frac{\sin 2\alpha}{(\sin^2 \alpha - \cos^2 \alpha) (\sin^2 \alpha + \cos^2 \alpha)} = \frac{\sin 2\alpha}{-\cos 2\alpha \cdot 1} = -\text{tg } 2\alpha \end{aligned}$$

110. Sadələşdirin: $\frac{2 \cos \alpha}{\text{ctg} \alpha \cos^3 \alpha - \sin^3 \alpha} =$

A) $\text{tg } 2\alpha$ B) $\text{ctg } 2\alpha$ C) 1 D) -1 E) $\cos 2\alpha$

$$\begin{aligned} & = \frac{2 \cos \alpha}{\frac{\cos \alpha}{\sin \alpha} \cos^3 \alpha - \sin^3 \alpha} = \frac{2 \cos \alpha \sin \alpha}{\frac{\cos^4 \alpha - \sin^4 \alpha}{\sin \alpha}} = \frac{2 \sin \alpha \cos \alpha}{(\cos^2 \alpha - \sin^2 \alpha) (\cos^2 \alpha + \sin^2 \alpha)} = \\ & = \frac{\sin 2\alpha}{\cos 2\alpha \cdot 1} = \text{tg } 2\alpha \end{aligned}$$

111. Hesablayın: $\frac{1 - \text{tg}^2 \frac{\pi}{8}}{\text{tg} \frac{\pi}{8}} =$

A) 1 B) 2 C) 1,5 D) 1,25 E) 2,5

$$\begin{aligned} & = \frac{1 - \frac{\sin^2 \frac{\pi}{8}}{\cos^2 \frac{\pi}{8}}}{\frac{\sin \frac{\pi}{8}}{\cos \frac{\pi}{8}}} = \frac{\cos^2 \frac{\pi}{8} - \sin^2 \frac{\pi}{8}}{\cos \frac{\pi}{8}} \cdot \frac{\cos \frac{\pi}{8}}{\sin \frac{\pi}{8}} = \frac{2 \cos \frac{\pi}{4}}{2 \sin \frac{\pi}{4} \cos \frac{\pi}{4}} = \frac{2 \cos \frac{\pi}{4}}{\sin \frac{\pi}{4}} = \\ & = 2 \text{tg} \frac{\pi}{4} = 2 \cdot 1 = 2 \end{aligned}$$

112. $\text{tg} \alpha = \frac{1}{5}$, $\text{tg} \beta = \frac{2}{3}$ olarsa, $\text{tg}(\alpha + \beta)$ -ni hesablayın

A) $\frac{13}{15}$ B) $\frac{17}{15}$ C) $\frac{13}{17}$ D) 1 E) $\frac{169}{225}$

$$\begin{aligned} \text{tg}(\alpha + \beta) & = \frac{\text{tg} \alpha + \text{tg} \beta}{1 - \text{tg} \alpha \text{tg} \beta} = \frac{\frac{1}{5} + \frac{2}{3}}{1 - \frac{1}{5} \cdot \frac{2}{3}} = \frac{\frac{3+10}{15}}{1 - \frac{2}{15}} = \frac{13}{15} \cdot \frac{15}{15-2} = \\ & = \frac{13}{15} \cdot \frac{15}{13} = 1 \end{aligned}$$

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113. $\operatorname{tg} \alpha = \frac{1}{2}$ olarsa, $\sin 2\alpha \cdot \cos 2\alpha \cdot \operatorname{tg} 2\alpha$ ifadəsinin qiymətini tapın.

A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $\frac{16}{25}$ D) $\frac{25}{16}$ E) 1

$$\begin{aligned} \sin 2\alpha \cdot \cos 2\alpha \cdot \operatorname{tg} 2\alpha &= \frac{2 \operatorname{tg} \alpha}{1 + \operatorname{tg}^2 \alpha} \cdot \frac{1 - \operatorname{tg}^2 \alpha}{1 + \operatorname{tg}^2 \alpha} \cdot \frac{2 \operatorname{tg} \alpha}{1 - \operatorname{tg}^2 \alpha} = \left(\frac{2 \operatorname{tg} \alpha}{1 + \operatorname{tg}^2 \alpha} \right)^2 = \\ &= \left(\frac{2 \cdot \frac{1}{2}}{1 + \left(\frac{1}{2}\right)^2} \right)^2 = \left(\frac{1}{1 + \frac{1}{4}} \right)^2 = \left(\frac{1}{\frac{5}{4}} \right)^2 = \left(\frac{4}{5} \right)^2 = \frac{16}{25} \end{aligned}$$

114. İfadəni sadələşdirin: $\operatorname{tg} \left(45^\circ + \frac{\alpha}{2} \right) \cdot \frac{1 - \sin \alpha}{\cos \alpha} =$

A) $\cos \frac{\alpha}{2}$ B) $\sin \frac{\alpha}{2}$ C) $\operatorname{tg} \frac{\alpha}{2}$ D) 2 E) 1

$$\begin{aligned} &= \sqrt{\frac{1 - \cos(90^\circ + \alpha)}{1 + \cos(90^\circ + \alpha)}} \cdot \frac{1 - \sin \alpha}{\cos \alpha} = \sqrt{\frac{1 + \sin \alpha}{1 - \sin \alpha}} \cdot \frac{(1 - \sin \alpha)^2}{\cos^2 \alpha} = \sqrt{\frac{1 - \sin \alpha}{\cos^2 \alpha}} = \\ &= \sqrt{\frac{\cos^2 \alpha}{\cos^2 \alpha}} = 1 \end{aligned}$$

115. İfadəni sadələşdirin: $\operatorname{tg} \left(\frac{\pi}{4} - \frac{\alpha}{2} \right) \cdot \frac{1 + \sin \alpha}{\cos \alpha} =$

A) 1 B) $2 \cos^2 \frac{\alpha}{2}$ C) $2 \sin^2 \frac{\alpha}{2}$ D) $\operatorname{tg}^2 \frac{\alpha}{2}$ E) 1

$$\begin{aligned} &= \sqrt{\frac{1 - \cos\left(\frac{\pi}{2} - \alpha\right)}{1 + \cos\left(\frac{\pi}{2} - \alpha\right)}} \cdot \frac{1 + \sin \alpha}{\cos \alpha} = \sqrt{\frac{1 - \sin \alpha}{1 + \sin \alpha}} \cdot \frac{(1 + \sin \alpha)^2}{\cos^2 \alpha} = \\ &= \sqrt{\frac{1 - \sin \alpha}{\cos^2 \alpha}} = \sqrt{\frac{\cos^2 \alpha}{\cos^2 \alpha}} = \sqrt{1} = 1. \end{aligned}$$

116. Hesablayın: $\frac{\sin^2 20^\circ}{2 \cos^2 10^\circ} + \cos 20^\circ =$

A) 1 B) -1 C) 0 D) $\cos 10^\circ$ E) $2 \sin 10^\circ$

$$\begin{aligned} &= \frac{(2 \sin 10^\circ \cos 10^\circ)^2}{2 \cos^2 10^\circ} + \cos 20^\circ = \frac{4 \sin^2 10^\circ \cos^2 10^\circ}{2 \cos^2 10^\circ} + \cos 20^\circ = \\ &= 2 \sin^2 10^\circ + \cos 20^\circ = 2 \sin^2 10^\circ + \cos^2 10^\circ - \sin^2 10^\circ = \\ &= \sin^2 10^\circ + \cos^2 10^\circ = 1. \end{aligned}$$

117. Hesablayın: $\frac{\cos 68^\circ \cos 14^\circ + \cos 22^\circ \cos 76^\circ}{\cos 53^\circ \cos 1^\circ - \cos 37^\circ \cos 89^\circ} =$

A) 1 B) -1 C) 2 D) $\sin 38^\circ$ E) $\cos 38^\circ$

$$= \frac{\sin 22^\circ \cos 14^\circ + \cos 22^\circ \sin 14^\circ}{\sin 37^\circ \cos 1^\circ - \cos 37^\circ \sin 1^\circ} = \frac{\sin(22^\circ + 14^\circ)}{\sin(37^\circ - 1^\circ)} = \frac{\sin 36^\circ}{\sin 36^\circ} = 1$$

118. Hesablayın: $\sin 20^\circ + \sin 40^\circ - \cos 10^\circ =$

A) 0 B) 1 C) $\frac{1}{2}$ D) 2 E) -1

$$\begin{aligned} &= 2 \sin \frac{20^\circ + 40^\circ}{2} \cdot \cos \frac{20^\circ - 40^\circ}{2} - \cos 10^\circ = 2 \sin 30^\circ \cos 10^\circ - \cos 10^\circ = \\ &= 2 \cdot \frac{1}{2} \cdot \cos 10^\circ - \cos 10^\circ = \cos 10^\circ - \cos 10^\circ = 0 \end{aligned}$$

119. Hesablayın: $\operatorname{tg} \left(\arccos \frac{\sqrt{2}}{2} \right) + \cos(2 \arctg 1) =$

A) -1 B) 1 C) 0 D) $\sqrt{3}$ E) 2

$$= \operatorname{tg} \frac{\pi}{4} + \cos 2 \cdot \frac{\pi}{4} = 1 + \cos \frac{\pi}{2} = 1 + 0 = 1$$

120. Hesablayın: $\frac{\cos 36^\circ}{\cos 63^\circ \cdot \cos 27^\circ} =$

A) 2 B) 1 C) $\frac{1}{2}$ D) $\sin 27^\circ$ E) $\cos 27^\circ$

$$= \frac{2 \cos 36^\circ}{2 \sin 27^\circ \cdot \cos 27^\circ} = \frac{2 \sin 54^\circ}{\sin 54^\circ} = 2$$

121. $\alpha = \frac{\pi}{3}$ olarsa, $\frac{\sin 3\alpha + \sin 4\alpha + \sin 5\alpha}{\cos 3\alpha + \cos 4\alpha + \cos 5\alpha}$ ifadəsinin qiymətini tapın

A) $\sqrt{2}$ B) $\sqrt{3}$ C) 1 D) $\frac{1}{\sqrt{3}}$ E) $-\sqrt{3}$

$$\begin{aligned} &= \frac{2 \sin \frac{3\alpha + 5\alpha}{2} \cdot \cos \frac{3\alpha - 5\alpha}{2} + \sin 4\alpha}{2 \cos \frac{3\alpha + 5\alpha}{2} \cdot \cos \frac{3\alpha - 5\alpha}{2} + \cos 4\alpha} = \frac{2 \sin 4\alpha \cos \alpha + \sin 4\alpha}{2 \cos 4\alpha \cos \alpha + \cos 4\alpha} = \\ &= \frac{\sin 4\alpha (2 \cos \alpha + 1)}{\cos 4\alpha (2 \cos \alpha + 1)} = \operatorname{tg} 4\alpha = \operatorname{tg} 4 \cdot \frac{\pi}{3} = \operatorname{tg} \frac{4\pi}{3} = \operatorname{tg} \left(\pi + \frac{\pi}{3} \right) = \\ &= \operatorname{tg} \frac{\pi}{3} = \sqrt{3} \end{aligned}$$

122. $\alpha = \frac{\pi}{9}$ olduqda ifadənin qiymətini tapın:

$$\frac{\sin 2\alpha - \sin 3\alpha + \sin 4\alpha}{\cos 2\alpha - \cos 3\alpha + \cos 4\alpha} =$$

A) $\sqrt{3}$ B) $\frac{\sqrt{3}}{2}$ C) $-\sqrt{3}$ D) $-\frac{\sqrt{3}}{2}$ E) 1

$$\begin{aligned} &= \frac{2 \sin \frac{2\alpha + 4\alpha}{2} \cdot \cos \frac{2\alpha - 4\alpha}{2} - \sin 3\alpha}{2 \cos \frac{2\alpha + 4\alpha}{2} \cdot \cos \frac{2\alpha - 4\alpha}{2} - \cos 3\alpha} = \frac{2 \sin 3\alpha \cos \alpha - \sin 3\alpha}{2 \cos 3\alpha \cos \alpha - \cos 3\alpha} = \\ &= \frac{\sin 3\alpha (2 \cos \alpha - 1)}{\cos 3\alpha (2 \cos \alpha - 1)} = \operatorname{tg} 3\alpha = \operatorname{tg} 3 \cdot \frac{\pi}{9} = \operatorname{tg} \frac{\pi}{3} = \sqrt{3} \end{aligned}$$

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123. İfadəni sadələşdirin: $\frac{\cos 10^\circ - \cos 30^\circ}{\operatorname{tg} 10^\circ + \operatorname{tg} 40^\circ} =$

A) $\sin 40^\circ$ B) $\sin^2 20^\circ$ C) $\operatorname{tg}^2 15^\circ$ D) 0 E) $\cos 40^\circ$

$$= \frac{-2 \sin \frac{10^\circ+30^\circ}{2} \sin \frac{10^\circ-30^\circ}{2}}{\frac{\sin 10^\circ + \sin 40^\circ}{\cos 10^\circ \cos 40^\circ}} = \frac{-2 \sin 20^\circ \cdot (-\sin 10^\circ)}{\frac{\sin 10^\circ \cos 40^\circ + \cos 10^\circ \sin 40^\circ}{\cos 10^\circ \cos 40^\circ}} = \frac{2 \sin 20^\circ \sin 10^\circ}{\sin(10^\circ+40^\circ)} = \frac{2 \sin 20^\circ \sin 10^\circ \cos 10^\circ \cos 40^\circ}{\sin 50^\circ} = \sin 20^\circ \sin 20^\circ = \sin^2 20^\circ$$

124. Hesablayın: $\sin \frac{\pi}{12} \cdot \cos \frac{5\pi}{12} = \frac{1}{2} \left(\sin \left(\frac{\pi}{12} + \frac{5\pi}{12} \right) + \sin \left(\frac{\pi}{12} - \frac{5\pi}{12} \right) \right) =$

A) $\frac{2-\sqrt{3}}{4}$ B) $\frac{1}{4}$ C) $\frac{3}{4}$ D) $\frac{2+\sqrt{3}}{4}$ E) $\frac{\sqrt{3}}{4}$

$$= \frac{1}{2} \left(\sin \frac{6\pi}{12} + \sin \frac{-4\pi}{12} \right) = \frac{1}{2} \left(\sin \frac{\pi}{2} - \sin \frac{4\pi}{12} \right) = \frac{1}{2} \left(1 - \sin \frac{\pi}{3} \right) = \frac{1}{2} \left(1 - \frac{\sqrt{3}}{2} \right) = \frac{1}{2} \cdot \frac{2-\sqrt{3}}{2} = \frac{2-\sqrt{3}}{4}$$

125. Hesablayın: $\cos \frac{\pi}{5} \cdot \cos \frac{2\pi}{5} =$

A) $-\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{3}{4}$ D) $-\frac{1}{2}$ E) $\frac{1}{4}$

$$= \frac{2 \sin \frac{\pi}{5} \cos \frac{\pi}{5} \cos \frac{2\pi}{5}}{2 \sin \frac{\pi}{5}} = \frac{2 \sin \frac{2\pi}{5} \cos \frac{2\pi}{5}}{2 \sin \frac{\pi}{5}} = \frac{\sin \frac{4\pi}{5}}{4 \sin \frac{\pi}{5}} = \frac{\sin \left(\pi - \frac{\pi}{5} \right)}{4 \sin \frac{\pi}{5}} = \frac{\sin \frac{\pi}{5}}{4 \sin \frac{\pi}{5}} = \frac{1}{4}$$

126. $\cos 195^\circ$ -ni hesablayın

A) $\frac{-\sqrt{6}-\sqrt{2}}{4}$ B) $\frac{\sqrt{6}+\sqrt{2}}{4}$ C) $\frac{\sqrt{6}-\sqrt{2}}{4}$ D) $\frac{\sqrt{2}-\sqrt{6}}{4}$ E) 0

$$\cos 195^\circ = \cos(180^\circ+15^\circ) = -\cos 15^\circ = -\cos(45^\circ-30^\circ) = -(\cos 45^\circ \cos 30^\circ + \sin 45^\circ \sin 30^\circ) = -\left(\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} \right) = -\frac{\sqrt{6}+\sqrt{2}}{4} = \frac{-\sqrt{6}-\sqrt{2}}{4}$$

127. Hesablayın: $\frac{1}{2 \sin 70^\circ} - 2 \cos 40^\circ = \frac{1}{2 \cos 20^\circ} - 2 \cos 40^\circ =$

A) -1 B) 1 C) 0 D) $\frac{1}{2}$ E) $-\frac{1}{2}$

$$= \frac{1 - 2 \cos 40^\circ \cdot 2 \cos 20^\circ}{2 \cos 20^\circ} = \frac{1 - 4 \cdot \frac{1}{2} (\cos(40^\circ+20^\circ) + \cos(40^\circ-20^\circ))}{2 \cos 20^\circ} = \frac{1 - 2(\cos 60^\circ + \cos 20^\circ)}{2 \cos 20^\circ} = \frac{1 - 2 \cdot \frac{1}{2} - 2 \cos 20^\circ}{2 \cos 20^\circ} = \frac{1 - 1 - 2 \cos 20^\circ}{2 \cos 20^\circ} = -1$$

128. $\operatorname{tga} = 0,75$ olarsa, $\cos 2\alpha$ -ni tapın.

A) 0,16 B) 0,12 C) 0,28 D) 0,56 E) 0

$$\cos 2\alpha = \frac{\cos^2 \alpha - \sin^2 \alpha}{\cos^2 \alpha + \sin^2 \alpha} = \frac{\frac{\cos^2 \alpha}{\cos^2 \alpha} - \frac{\sin^2 \alpha}{\cos^2 \alpha}}{\frac{\cos^2 \alpha}{\cos^2 \alpha} + \frac{\sin^2 \alpha}{\cos^2 \alpha}} = \frac{1 - \operatorname{tg}^2 \alpha}{1 + \operatorname{tg}^2 \alpha} = \frac{1 - 0,75^2}{1 + 0,75^2} = \frac{1 - \left(\frac{3}{4}\right)^2}{1 + \left(\frac{3}{4}\right)^2} = \frac{1 - \frac{9}{16}}{1 + \frac{9}{16}} = \frac{\frac{16-9}{16}}{\frac{16+9}{16}} = \frac{7}{25} = 0,28$$

129. $\operatorname{tg}(\alpha + \beta) = -1$ və $\operatorname{tg}(\alpha - \beta) = \frac{1}{2}$ olduqda $\operatorname{tg} 2\beta$ -ni tapın.

A) 2 B) 1 C) -3 D) -2 E) -4

$$\operatorname{tg} 2\beta = \operatorname{tg}(\beta + \beta) = \operatorname{tg}(\alpha + \beta - \alpha + \beta) = \operatorname{tg}(\alpha + \beta) - (\alpha - \beta) = \frac{\operatorname{tg}(\alpha + \beta) - \operatorname{tg}(\alpha - \beta)}{1 + \operatorname{tg}(\alpha + \beta) \cdot \operatorname{tg}(\alpha - \beta)} = \frac{-1 - \frac{1}{2}}{1 + (-1) \cdot \frac{1}{2}} = \frac{-\frac{3}{2}}{1 - \frac{1}{2}} = \frac{-\frac{3}{2}}{\frac{1}{2}} = -3$$

130. Hesablayın: $\frac{\operatorname{tg} \frac{5\pi}{36} + \operatorname{tg} \frac{\pi}{9}}{1 + \operatorname{tg} \frac{31\pi}{36} \operatorname{tg} \frac{\pi}{9}} = \frac{\operatorname{tg} \frac{5\pi}{36} + \operatorname{tg} \frac{\pi}{9}}{1 + \operatorname{tg} \left(\pi - \frac{5\pi}{36} \right) \operatorname{tg} \frac{\pi}{9}} = \frac{\operatorname{tg} \frac{5\pi}{36} + \operatorname{tg} \frac{\pi}{9}}{1 - \operatorname{tg} \frac{5\pi}{36} \operatorname{tg} \frac{\pi}{9}} =$

A) 1 B) 0,5 C) -1 D) $\sqrt{3}$ E) 0

$$= \operatorname{tg} \left(\frac{5\pi}{36} + \frac{\pi}{9} \right) = \operatorname{tg} \frac{5\pi+4\pi}{36} = \operatorname{tg} \frac{9\pi}{36} = \operatorname{tg} \frac{\pi}{4} = 1$$

131. Hesablayın: $\frac{\operatorname{tg} \frac{7\pi}{36} + \operatorname{tg} \frac{41\pi}{36}}{1 + \operatorname{tg} \frac{29\pi}{36} \operatorname{tg} \frac{5\pi}{36}} = \frac{\operatorname{tg} \frac{7\pi}{36} + \operatorname{tg} \left(\pi + \frac{5\pi}{36} \right)}{1 + \operatorname{tg} \left(\pi - \frac{7\pi}{36} \right) \operatorname{tg} \frac{5\pi}{36}} =$

A) $\sqrt{3}$ B) $\frac{\sqrt{3}}{3}$ C) $-\sqrt{3}$ D) $-\frac{\sqrt{3}}{3}$ E) -1

$$= \frac{\operatorname{tg} \frac{7\pi}{36} + \operatorname{tg} \frac{5\pi}{36}}{1 - \operatorname{tg} \frac{7\pi}{36} \operatorname{tg} \frac{5\pi}{36}} = \operatorname{tg} \left(\frac{7\pi}{36} + \frac{5\pi}{36} \right) = \operatorname{tg} \frac{12\pi}{36} = \operatorname{tg} \frac{\pi}{3} = \sqrt{3}$$

132. $\operatorname{tga} = \frac{1}{2}$ olarsa, $\sin 2\alpha - \cos 2\alpha$ ifadəsinin qiymətini tapın.

A) $\frac{1}{2}$ B) 0 C) 0,2 D) $\frac{5}{16}$ E) 2,1

$$\sin 2\alpha - \cos 2\alpha = \frac{2 \operatorname{tg} \alpha}{1 + \operatorname{tg}^2 \alpha} - \frac{1 - \operatorname{tg}^2 \alpha}{1 + \operatorname{tg}^2 \alpha} = \frac{2 \operatorname{tg} \alpha - 1 + \operatorname{tg}^2 \alpha}{1 + \operatorname{tg}^2 \alpha} = \frac{2 \cdot \frac{1}{2} - 1 + \left(\frac{1}{2}\right)^2}{1 + \left(\frac{1}{2}\right)^2} = \frac{1 - 1 + \frac{1}{4}}{1 + \frac{1}{4}} = \frac{\frac{1}{4}}{\frac{5}{4}} = \frac{1}{5} = 0,2$$

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133. Hesablayın: $\sin 20^\circ + \sin 40^\circ - \cos 10^\circ =$

A) $\frac{1}{4}$ B) 1 C) $\frac{\sqrt{3}}{2}$ D) $\frac{1}{2}$ **(E) 0**

$$= 2 \sin \frac{20^\circ + 40^\circ}{2} \cos \frac{20^\circ - 40^\circ}{2} - \cos 10^\circ = 2 \sin 30^\circ \cos 10^\circ - \cos 10^\circ =$$

$$= 2 \cdot \frac{1}{2} \cos 10^\circ - \cos 10^\circ = \cos 10^\circ - \cos 10^\circ = 0$$

134. İfadənin qiymətini tapın: $\operatorname{tg}^2 15^\circ + 4 \operatorname{tg} 60^\circ =$

(A) 7 B) 6 C) 5 D) 2 E) $4\sqrt{3} + 1$

$$= \frac{1 - \cos 30^\circ}{1 + \cos 30^\circ} + 4\sqrt{3} = \frac{1 - \frac{\sqrt{3}}{2}}{1 + \frac{\sqrt{3}}{2}} + 4\sqrt{3} = \frac{2 - \sqrt{3}}{2 + \sqrt{3}} + 4\sqrt{3} =$$

$$= \frac{2 - \sqrt{3}}{2 + \sqrt{3}} + 4\sqrt{3} = \frac{(2 - \sqrt{3})(2 - \sqrt{3})}{(2 + \sqrt{3})(2 - \sqrt{3})} + 4\sqrt{3} = \frac{(2 - \sqrt{3})^2}{2^2 - \sqrt{3}^2} + 4\sqrt{3} =$$

$$= \frac{4 - 4\sqrt{3} + 3}{4 - 3} + 4\sqrt{3} = 7 - 4\sqrt{3} + 4\sqrt{3} = 7$$

135. Hesablayın: $\frac{2}{\sqrt{6}} \left[\arccos\left(-\frac{\sqrt{3}}{2}\right) + \arcsin \frac{\sqrt{3}}{2} + \operatorname{arctg} \sqrt{3} \right] =$

A) π B) 1 **(C) 3** D) $\frac{\sqrt{3}}{2}$ E) $\frac{1}{2}$

$$= \frac{2}{\sqrt{6}} \left[\frac{\pi}{3} + \frac{\pi}{3} + \frac{\pi}{3} \right] = \frac{2}{\sqrt{6}} \cdot \frac{6\pi - \pi + \pi + \pi}{3} = \frac{2}{\sqrt{6}} \cdot \frac{9\pi}{3} = \frac{18\pi}{6} = 3$$

136. Sadəl əşdirin: $\frac{1 + \sin 2\alpha}{(\sin \alpha + \cos \alpha)^2} = \frac{\sin^2 \alpha + \cos^2 \alpha + 2 \sin \alpha \cos \alpha}{\sin^2 \alpha + 2 \sin \alpha \cos \alpha + \cos^2 \alpha} = 1$

A) -1 **(B) 1** C) 2 D) -2 E) 0

137. Sadəl əşdirin: $\frac{1 - \sin 2\alpha}{(\cos \alpha - \sin \alpha)^2} = \frac{\sin^2 \alpha + \cos^2 \alpha - 2 \sin \alpha \cos \alpha}{\cos^2 \alpha - 2 \sin \alpha \cos \alpha + \sin^2 \alpha} = 1$

A) 1 B) $\cos 2\alpha$ C) -1 D) $\sin 2\alpha$ E) 0

138. $\operatorname{tg} \alpha = 2$ olduqda $\frac{4 - 5 \sin \alpha \cos \alpha}{7}$ ifadəsini qiymətini tapın.

(A) $\frac{2}{7}$ B) $\frac{7}{2}$ C) $\frac{3}{7}$ D) $\frac{7}{3}$ E) $\frac{5}{7}$

$$\frac{4 - 5 \sin \alpha \cos \alpha}{7} = \frac{4(\sin^2 \alpha + \cos^2 \alpha) - 5 \sin \alpha \cos \alpha}{7(\sin^2 \alpha + \cos^2 \alpha)} = \frac{4 \sin^2 \alpha + 4 \cos^2 \alpha - 5 \sin \alpha \cos \alpha}{7 \sin^2 \alpha + 7 \cos^2 \alpha}$$

$$= \frac{\frac{4 \sin^2 \alpha}{\cos^2 \alpha} + \frac{4 \cos^2 \alpha}{\cos^2 \alpha} - \frac{5 \sin \alpha \cos \alpha}{\cos^2 \alpha}}{\frac{7 \sin^2 \alpha}{\cos^2 \alpha} + \frac{7 \cos^2 \alpha}{\cos^2 \alpha}} = \frac{4 \operatorname{tg}^2 \alpha + 4 - 5 \operatorname{tg} \alpha}{7 \operatorname{tg}^2 \alpha + 7} = \frac{4 \cdot 2^2 + 4 - 5 \cdot 2}{7 \cdot 2^2 + 7} =$$

$$= \frac{10}{35} = \frac{2}{7}$$

139. Hesablayın: $\cos 92^\circ \cos 2^\circ + 0,5 \sin 4^\circ + 1 =$

A) 0,5 **(B) 1** C) -1 D) 1,5 E) -1,5

$$= \frac{1}{2} (\cos(92^\circ + 2^\circ) + \cos(92^\circ - 2^\circ)) + \frac{1}{2} \sin 4^\circ + 1 =$$

$$= \frac{1}{2} (\cos 94^\circ + \cos 90^\circ) + \frac{1}{2} \sin 4^\circ + 1 = \frac{1}{2} \cos(90^\circ + 4^\circ) + \frac{1}{2} \sin 4^\circ + 1 =$$

$$= -\frac{1}{2} \sin 4^\circ + \frac{1}{2} \sin 4^\circ + 1 = 1$$

140. Hesablayın: $\frac{\sqrt{3}(\cos 57^\circ \cos 27^\circ + \sin 57^\circ \sin 27^\circ)}{\cos^2 \frac{\pi}{6} - \sin^2 \frac{\pi}{6}} =$

A) $\frac{3}{4}$ B) $\sqrt{3}$ **(C) 3** D) 1 E) $\frac{\sqrt{3}}{2}$

$$= \frac{\sqrt{3} \cos(57^\circ - 27^\circ)}{\cos 2 \frac{\pi}{6}} = \frac{\sqrt{3} \cos 30^\circ}{\cos \frac{\pi}{3}} = \frac{\sqrt{3} \cdot \frac{\sqrt{3}}{2}}{\frac{1}{2}} = \frac{3}{2} \cdot \frac{2}{1} = 3$$

141. Hesablayın: $\frac{\sqrt{2}(\sin 57^\circ \cos 27^\circ - \cos 57^\circ \sin 27^\circ)}{\cos^2 \frac{\pi}{8} - \sin^2 \frac{\pi}{8}} =$

A) $\sqrt{2}$ B) 2 C) $\frac{\sqrt{2}}{2}$ **(D) 1** E) $\frac{1}{2}$

$$= \frac{\sqrt{2} \sin(57^\circ - 27^\circ)}{\cos 2 \frac{\pi}{8}} = \frac{\sqrt{2} \sin 30^\circ}{\cos \frac{\pi}{4}} = \frac{\sqrt{2} \cdot \frac{1}{2}}{\frac{\sqrt{2}}{2}} = \frac{\sqrt{2}}{2} \cdot \frac{2}{\sqrt{2}} = 1$$

142. Hesablayın: $\frac{1}{2 \sin 10^\circ} - 2 \sin 70^\circ =$

A) $\sin 70^\circ$ B) 2 C) $\operatorname{tg} 70^\circ$ **(D) 1** E) $\sin 10^\circ$

$$= \frac{1 - 4 \sin 70^\circ \sin 10^\circ}{2 \sin 10^\circ} = \frac{1 + 4 \cdot \frac{1}{2} (\cos(30^\circ + 10^\circ) - \cos(40^\circ - 10^\circ))}{2 \sin 10^\circ} =$$

$$= \frac{1 + 2(\cos 80^\circ - \cos 60^\circ)}{2 \cos 80^\circ} = \frac{1 + 2 \cos 80^\circ - 2 \cdot \frac{1}{2}}{2 \cos 80^\circ} = \frac{1 + 2 \cos 80^\circ - 1}{2 \cos 80^\circ} = 1$$

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143. Sadələşdirin: $\frac{\sin 3\alpha + \sin 7\alpha}{\cos 3\alpha + \cos 7\alpha} =$
 (A) $\text{tg } 5\alpha$ (B) $\text{ctg } 5\alpha$ (C) $\text{tg } 2\alpha$ (D) $\text{ctg } 2\alpha$ (E) 1

$$= \frac{2 \sin \frac{3\alpha+7\alpha}{2} \cdot \cos \frac{3\alpha-7\alpha}{2}}{2 \cos \frac{3\alpha+7\alpha}{2} \cdot \cos \frac{3\alpha-7\alpha}{2}} = \frac{2 \sin 5\alpha \cdot \cos 2\alpha}{2 \cos 5\alpha \cdot \cos 2\alpha} = \text{tg } 5\alpha$$

144. $\sin \alpha + \cos \alpha = \sqrt{2}$ olduğunu bilərək, $\frac{\sin^2 2\alpha}{\sin(\alpha + \frac{3\pi}{2}) \cdot \cos(\frac{\pi}{2} - \alpha)} =$

ifadəsinin qiymətini tapın

- (A) $4\sqrt{2}$ (B) -2 (C) $2\sqrt{2}$ (D) 4 (E) -4

$$= \frac{(2 \sin \alpha \cdot \cos \alpha)^2}{-\cos \alpha \cdot \sin \alpha} = \frac{4 \sin^2 \alpha \cdot \cos^2 \alpha}{-\sin \alpha \cdot \cos \alpha} = -4 \sin \alpha \cos \alpha = -4 \cdot \frac{1}{2} = -2$$

$$(\sin \alpha + \cos \alpha)^2 = \sqrt{2}^2$$

$$\sin^2 \alpha + 2 \sin \alpha \cos \alpha + \cos^2 \alpha = 2$$

$$1 + 2 \sin \alpha \cos \alpha = 2$$

$$2 \sin \alpha \cos \alpha = 1$$

$$\sin \alpha \cos \alpha = \frac{1}{2}$$

145. Sadələşdirin: $\frac{1}{2} \sin 10x (\text{tg } 5x + \text{ctg } 5x) =$

- (A) 1 (B) 2 (C) $\text{tg}^2 5x$ (D) $\text{ctg}^2 5x$ (E) $\sin 10x$

$$= \frac{1}{2} \sin 10x \left(\frac{\sin 5x}{\cos 5x} + \frac{\cos 5x}{\sin 5x} \right) = \frac{1}{2} \sin 10x \cdot \frac{\sin^2 5x + \cos^2 5x}{\sin 5x \cos 5x} =$$

$$= \frac{\sin 10x \cdot 1}{2 \sin 5x \cos 5x} = \frac{\sin 10x}{\sin 10x} = 1$$

146. İfadəni sadələşdirin: $\cos^2(\frac{3\pi}{4} - \alpha) + 0,5 \sin 2\alpha =$

- (A) $-\frac{1}{2}$ (B) $\frac{1}{2}$ (C) 1 (D) $\frac{3}{2}$ (E) 0

$$= \frac{1 + \cos(\frac{3\pi}{2} - 2\alpha)}{2} + \frac{1}{2} \sin 2\alpha = \frac{1 - \sin 2\alpha + \sin 2\alpha}{2} = \frac{1}{2}$$

147. Hesablayın: $\frac{\sin 60^\circ}{\sin^4 15^\circ - \cos^4 15^\circ} =$

- (A) 1 (B) $\frac{1}{2}$ (C) 2 (D) -1 (E) $\sqrt{3}$

$$= \frac{\sin 60^\circ}{(\sin^2 15^\circ + \cos^2 15^\circ) \cdot (\sin^2 15^\circ - \cos^2 15^\circ)} = \frac{\cos 30^\circ}{1 \cdot (-\cos 30^\circ)} = \frac{\cos 30^\circ}{-\cos 30^\circ} = -1$$

148. $\sin \frac{\alpha}{2} + \cos \frac{\alpha}{2} = \frac{1}{2}$ olduqda $\sin \alpha$ -ni tapın.

- (A) 0,75 (B) 0,5 (C) $-0,75$ (D) $-0,5$ (E) 0,25

$$\left(\sin \frac{\alpha}{2} + \cos \frac{\alpha}{2} \right)^2 = \left(\frac{1}{2} \right)^2$$

$$\sin^2 \frac{\alpha}{2} + 2 \sin \frac{\alpha}{2} \cos \frac{\alpha}{2} + \cos^2 \frac{\alpha}{2} = \frac{1}{4}$$

$$1 + \sin \alpha = \frac{1}{4}$$

$$\sin \alpha = 0,25 - 1 = -0,75$$

$$\sin \alpha = -0,75$$

149. $\text{tg}(\frac{1}{2} \arcsin \frac{5}{13})$ -i tapın

- (A) $\frac{15}{8}$ (B) $\frac{1}{5}$ (C) $-\frac{3}{5}$ (D) $-\frac{8}{15}$ (E) $\frac{8}{15}$

$$\frac{1}{2} \arcsin \frac{5}{13} = \alpha$$

$$\arcsin \frac{5}{13} = 2\alpha$$

$$\sin(\arcsin \frac{5}{13}) = \sin 2\alpha$$

$$\frac{5}{13} = \sin 2\alpha$$

$$\sin 2\alpha = \frac{5}{13}; \text{tg } \alpha = ?$$

$$\text{tg } \alpha = \sqrt{\frac{1 - \cos 2\alpha}{1 + \cos 2\alpha}} = \sqrt{\frac{1 - \frac{12}{13}}{1 + \frac{12}{13}}} = \sqrt{\frac{\frac{13-12}{13}}{\frac{13+12}{13}}} =$$

$$= \sqrt{\frac{1}{25}} = \frac{1}{5}$$

$$\cos 2\alpha = \sqrt{1 - \sin^2 2\alpha} = \sqrt{1 - \left(\frac{5}{13}\right)^2} = \sqrt{1 - \frac{25}{169}} = \frac{12}{13}$$

150. Sadələşdirin: $\cos(\alpha - \beta) (\text{tg } \alpha \text{tg } \beta - 1) + (1 + \text{tg } \alpha \text{tg } \beta) \cos(\alpha + \beta) =$

- (A) 1 (B) $\cos^2 \alpha + \cos^2 \beta$ (C) $\sin^2 \alpha + \sin^2 \beta$

- (D) 0 (E) $\cos \alpha + \cos \beta$

$$= \cos(\alpha - \beta) \left(\frac{\sin \alpha \sin \beta}{\cos \alpha \cos \beta} - 1 \right) + \left(1 + \frac{\sin \alpha \sin \beta}{\cos \alpha \cos \beta} \right) \cos(\alpha + \beta) =$$

$$= \cos(\alpha - \beta) \cdot \frac{\sin \alpha \sin \beta - \cos \alpha \cos \beta}{\cos \alpha \cos \beta} + \frac{\cos \alpha \cos \beta + \sin \alpha \sin \beta}{\cos \alpha \cos \beta} \cdot \cos(\alpha + \beta) =$$

$$= \cos(\alpha - \beta) \cdot \frac{-\cos(\alpha + \beta)}{\cos \alpha \cos \beta} + \frac{\cos(\alpha + \beta)}{\cos \alpha \cos \beta} \cdot \cos(\alpha + \beta) = 0$$

151. $\text{ctg}(\frac{1}{2} \arccos \frac{1}{\sqrt{5}})$ -i tapın

- (A) $\frac{1+\sqrt{5}}{2}$ (B) $\frac{1}{2}$ (C) $\frac{1}{\sqrt{5}}$ (D) $\frac{\sqrt{2}}{2}$ (E) $-\frac{2}{3}$

$$\frac{1}{2} \arccos \frac{1}{\sqrt{5}} = \alpha$$

$$\arccos \frac{1}{\sqrt{5}} = 2\alpha$$

$$\cos(\arccos \frac{1}{\sqrt{5}}) = \cos 2\alpha$$

$$\frac{1}{\sqrt{5}} = \cos 2\alpha$$

$$\cos 2\alpha = \frac{1}{\sqrt{5}}$$

$$\text{ctg } \alpha = \sqrt{\frac{1 + \cos 2\alpha}{1 - \cos 2\alpha}} = \sqrt{\frac{1 + \frac{1}{\sqrt{5}}}{1 - \frac{1}{\sqrt{5}}}} = \sqrt{\frac{\frac{\sqrt{5}+1}{\sqrt{5}}}{\frac{\sqrt{5}-1}{\sqrt{5}}}} =$$

$$= \sqrt{\frac{\sqrt{5}+1}{\sqrt{5}-1}} = \sqrt{\frac{(\sqrt{5}+1)(\sqrt{5}+1)}{(\sqrt{5}-1)(\sqrt{5}+1)}} = \sqrt{\frac{(\sqrt{5}+1)^2}{5-1}} =$$

$$= \frac{\sqrt{5}+1}{2}$$

152. Hesablayın: $\sin 10^\circ + \sin 50^\circ - \sin 70^\circ =$

- (A) $\sin 10^\circ$ (B) $\frac{\sqrt{3}}{2}$ (C) 1 (D) 0 (E) -1

$$= 2 \sin \frac{10^\circ+50^\circ}{2} \cdot \cos \frac{10^\circ-50^\circ}{2} - \cos 20^\circ = 2 \sin 30^\circ \cos 20^\circ - \cos 20^\circ =$$

$$= 2 \cdot \frac{1}{2} \cdot \cos 20^\circ - \cos 20^\circ = 0$$

153. Hesablayın: $16 \cdot (\sin^2 105^\circ - \sin^2 15^\circ) =$

- (A) $8\sqrt{3}$ (B) $-8\sqrt{3}$ (C) $4\sqrt{3}$ (D) $-4\sqrt{3}$ (E) 8

$$= 16 \cdot (\sin^2(90^\circ+15^\circ) - \sin^2 15^\circ) = 16 (\cos^2 15^\circ - \sin^2 15^\circ) =$$

$$= 16 \cos 30^\circ = 16 \cdot \frac{\sqrt{3}}{2} = 8\sqrt{3}$$

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154. Hesablayın: $8 \cdot (\sin^2 15^\circ - \sin^2 75^\circ) =$
 A) 4 B) -4 C) $-2\sqrt{3}$ D) $2\sqrt{3}$ **E) $-4\sqrt{3}$**
 $= 8 \cdot (\sin^2 15^\circ - \cos^2 15^\circ) = -8 \cos 30^\circ = -8 \cdot \frac{\sqrt{3}}{2} = -4\sqrt{3}$

155. Sadələşdirin: $\frac{\sin \alpha + \sin 5\alpha}{\cos \alpha + \cos 5\alpha} =$
 A) $\text{tg} 3\alpha$ B) $\text{tg} 2\alpha$ C) $\text{tg} \alpha$ D) $-\text{tg} 2\alpha$ E) $\text{tg} 3\alpha$
 $= \frac{2 \sin \frac{\alpha+5\alpha}{2} \cdot \cos \frac{\alpha-5\alpha}{2}}{2 \cos \frac{\alpha+5\alpha}{2} \cdot \cos \frac{\alpha-5\alpha}{2}} = \frac{\sin 3\alpha}{\cos 3\alpha} = \text{tg} 3\alpha$

$1 - (\sin^4 15^\circ + \cos^4 15^\circ) = 1 - (\sin^4 15^\circ + 2 \sin^2 15^\circ \cos^2 15^\circ + \cos^4 15^\circ - 2 \sin^2 15^\circ \cos^2 15^\circ) = 1 - (\sin^2 15^\circ + \cos^2 15^\circ) + \frac{1}{2} \sin^2 30^\circ = 1 - 1 + \frac{1}{2} \left(\frac{1}{2}\right)^2 = \frac{1}{2} - \frac{1}{4} = \frac{1}{8}$

156. Hesablayın: $1 - \sin^4 15^\circ - \cos^4 15^\circ =$
 A) $\frac{9}{14}$ B) $\frac{\sqrt{3}}{4}$ **C) $\frac{1}{8}$** D) $\frac{3}{8}$ E) $\frac{3}{4}$
 $= (1 - \sin^2 15^\circ)(1 + \sin^2 15^\circ) - \cos^4 15^\circ = \cos^2 15^\circ (1 + \sin^2 15^\circ) - \cos^4 15^\circ = \cos^2 15^\circ (1 + \sin^2 15^\circ - \cos^2 15^\circ) = \cos^2 15^\circ (1 - \cos 30^\circ) = \frac{1 + \cos 30^\circ}{2} \cdot (1 - \cos 30^\circ) = \frac{1}{2} (1 + \cos 30^\circ)(1 - \cos 30^\circ) = \frac{1}{2} (1 - \cos^2 30^\circ) = \frac{1}{2} \sin^2 30^\circ = \frac{1}{2} \left(\frac{1}{2}\right)^2 = \frac{1}{2} \cdot \frac{1}{4} = \frac{1}{8}$

157. Hesablayın: $\cos^3 \frac{\pi}{24} \sin \frac{\pi}{24} - \sin^3 \frac{\pi}{24} \cos \frac{\pi}{24} =$
 A) 1 B) $\frac{1}{2}$ C) $\frac{1}{4}$ D) $-\frac{1}{2}$ **E) $\frac{1}{8}$**
 $= \frac{1}{2} \cdot 2 \sin \frac{\pi}{24} \cos \frac{\pi}{24} (\cos^2 \frac{\pi}{24} - \sin^2 \frac{\pi}{24}) = \frac{1}{2} \cdot \frac{1}{2} \cdot 2 \sin \frac{\pi}{12} \cos \frac{\pi}{12} = \frac{1}{4} \sin \frac{\pi}{6} = \frac{1}{4} \cdot \frac{1}{2} = \frac{1}{8}$

158. Hesablayın: $\cos 130^\circ + \sin 80^\circ - \sin 20^\circ =$
 A) -1 B) $-\frac{1}{2}$ C) $\frac{1}{2}$ **D) 0** E) 1
 $= \cos (90^\circ + 40^\circ) + \sin 80^\circ - \sin 20^\circ = -\sin 40^\circ + \sin 80^\circ - \sin 20^\circ = \sin 80^\circ - \sin 40^\circ - \sin 20^\circ = 2 \cos \frac{80^\circ + 40^\circ}{2} \cdot \sin \frac{80^\circ - 40^\circ}{2} - \sin 20^\circ = 2 \cos 60^\circ \cdot \sin 20^\circ - \sin 20^\circ = 2 \cdot \frac{1}{2} \cdot \sin 20^\circ - \sin 20^\circ = 0$

159. Hesablayın: $\sin 18^\circ \cdot \sin 54^\circ =$
 A) $\text{tg} 18^\circ$ B) $\sin 108^\circ$ **C) $\frac{1}{4}$** D) $\frac{1}{2}$ E) $-\frac{1}{4}$
 $= \frac{2 \sin 18^\circ \cos 18^\circ \sin 54^\circ}{2 \cos 18^\circ} = \frac{2 \sin 36^\circ \cos 36^\circ}{2 \cdot 2 \cos 18^\circ} = \frac{\sin 72^\circ}{4 \sin 72^\circ} = \frac{1}{4}$

160. İfadənin qiymətini tapın: $\sin 18^\circ - \sin 54^\circ =$
 A) $-\frac{1}{8}$ B) $-\frac{1}{4}$ **C) $-\frac{1}{2}$** D) $-\frac{\sqrt{2}}{2}$ E) $-\frac{\sqrt{3}}{2}$
 $= 2 \cos \frac{18^\circ + 54^\circ}{2} \cdot \sin \frac{18^\circ - 54^\circ}{2} = 2 \cos 36^\circ \cdot (-\sin 18^\circ) = -2 \frac{\sin 18^\circ \cos 18^\circ \cos 36^\circ}{\cos 18^\circ} = -2 \frac{\sin 36^\circ \cos 36^\circ}{2 \cos 18^\circ} = -\frac{\sin 72^\circ}{2 \cos 18^\circ} = -\frac{\cos 18^\circ}{2 \cos 18^\circ} = -\frac{1}{2}$

161. Hesablayın: $\sin^2 15^\circ + \sin^2 30^\circ + \sin^2 45^\circ + \sin^2 60^\circ + \sin^2 75^\circ =$
 A) 1 B) 1,5 C) 2 **D) 2,5** E) 3
 $= \sin^2 15^\circ + \cos^2 15^\circ + \sin^2 30^\circ + \cos^2 30^\circ + \left(\frac{1}{\sqrt{2}}\right)^2 = 1 + 1 + \frac{1}{2} = 2,5$

162. $\frac{\sin 3\alpha}{\sin \alpha} + \frac{\cos 3\alpha}{\cos \alpha} = 1$ olduğunu bilərək, $\cos^2 \alpha$ -ni tapın.
 A) $\frac{5}{8}$ B) $\frac{3}{4}$ C) $\frac{2}{3}$ D) $\frac{1}{3}$ E) $\frac{1}{2}$
 $1 = \frac{\sin 3\alpha \cos \alpha + \cos 3\alpha \sin \alpha}{\sin \alpha \cos \alpha} = \frac{\sin(3\alpha + \alpha)}{\sin \alpha \cos \alpha} = \frac{2 \sin 4\alpha}{2 \sin \alpha \cos \alpha} = \frac{2 \cdot 2 \sin 2\alpha \cos 2\alpha}{2 \sin 2\alpha} = 4 \cos 2\alpha = 4 \cdot (2 \cos^2 \alpha - 1) = 8 \cos^2 \alpha - 4 = 1$
 $8 \cos^2 \alpha = 5$
 $\cos^2 \alpha = \frac{5}{8}$

163. Hesablayın: $\frac{\sqrt{2}(\cos 57^\circ + \cos 33^\circ)}{\sin 39^\circ \cdot \sin 51^\circ} = \frac{\sqrt{2} \cdot 2 \cos \frac{57^\circ + 33^\circ}{2} \cos \frac{57^\circ - 33^\circ}{2}}{\sin 39^\circ \cdot \sin 51^\circ} =$
 A) 4 B) 2 C) $2\sqrt{2}$ D) $\sqrt{2}$ E) 1
 $= \frac{2\sqrt{2} \cos 45^\circ \cos 12^\circ}{-\frac{1}{1} (\cos(51^\circ + 39^\circ) - \cos(51^\circ - 39^\circ))} = \frac{2\sqrt{2} \cdot \frac{1}{\sqrt{2}} \cdot \cos 12^\circ}{-\frac{1}{2} (\cos 90^\circ - \cos 12^\circ)} = \frac{-2 \cos 12^\circ}{0 - \cos 12^\circ} = \frac{-4 \cos 12^\circ}{-\cos 12^\circ} = 4$

164. $\text{tg} \frac{\alpha}{2} = 0$ və $0 \leq \alpha \leq 90^\circ$ olarsa, $9 \sin(\alpha + 30^\circ) + 11 \cos(60^\circ - \alpha) =$ ifadəsinin qiymətini tapın.
 A) 10 B) 20 C) 2 D) -2 E) $10\sqrt{3}$
 $= 9 \sin(\alpha + 30^\circ) + 11 \sin(90^\circ - (60^\circ - \alpha)) = 9 \sin(\alpha + 30^\circ) + 11 \sin(30^\circ + \alpha) = 20 \sin(\alpha + 30^\circ) = 20 \sin(0^\circ + 30^\circ) = 20 \cdot \frac{1}{2} = 10$
 $\text{tg} \frac{\alpha}{2} = 0 \Rightarrow \frac{\alpha}{2} = 0^\circ \Rightarrow \alpha = 0^\circ$

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165. Hesablayın: $\cos 0^\circ + \cos 1^\circ + \dots + \cos 178^\circ + \cos 179^\circ =$
 A) 0 B) 2 **C) 1** D) -2 E) -1
 $= \cos 0^\circ + \cos 1^\circ + \cos 2^\circ + \dots + \cos (180^\circ - 2^\circ) + \cos (180^\circ - 1^\circ) =$
 $= 1 + \cos 1^\circ + \cos 2^\circ + \dots + (-\cos 2^\circ) + (-\cos 1^\circ) = 1$

166. $\operatorname{tg}(\alpha + 30^\circ) = 1$ və $0 < \alpha < 90^\circ$ olarsa,
 $2 \sin(75^\circ + \alpha) + 10 \cos(75^\circ - \alpha)$ ifadəsini qiymətini tapın.
 A) 12 B) 8 **C) 7** D) 6 E) -8

$\operatorname{tg}(\alpha + 30^\circ) = 1, \quad 0 < \alpha < 90^\circ$
 $\alpha + 30^\circ = 45^\circ$
 $\alpha = 45^\circ - 30^\circ$
 $\alpha = 15^\circ$
 $2 \sin(75^\circ + 15^\circ) + 10 \cos(75^\circ - 15^\circ) = 2 \sin 90^\circ + 10 \cos 60^\circ = 2 \cdot 1 + 10 \cdot \frac{1}{2} =$
 $= 2 + 5 = 7.$

167. Hesablayın: $\frac{\sin 65^\circ + \sin 25^\circ}{\sqrt{2} \sin 35^\circ \sin 55^\circ} = \frac{2 \sin \frac{65^\circ + 25^\circ}{2} \cos \frac{65^\circ - 25^\circ}{2}}{\sqrt{2} \sin 35^\circ \sin 55^\circ} =$
 A) $\frac{\sqrt{2}}{2}$ B) $\frac{1}{2}$ C) 1 **D) 2** E) $\frac{\sqrt{5}}{2}$
 $= \frac{2 \sin 45^\circ \cos 20^\circ}{\sqrt{2} \cdot \left(-\frac{1}{2}\right) (\cos(35^\circ + 55^\circ) - \cos(55^\circ - 35^\circ))} = \frac{2 \cdot \frac{\sqrt{2}}{2} \cos 20^\circ}{-\frac{\sqrt{2}}{2} (\cos 90^\circ - \cos 20^\circ)} =$
 $= \frac{2 \cos 20^\circ}{0 + \cos 20^\circ} = 2$

168. İfadəni sadələşdirin: $\frac{\operatorname{tg}^2(45^\circ + \alpha) - 1}{\operatorname{tg}^2(45^\circ + \alpha) + 1} =$
A) $\sin 2\alpha$ B) $\cos 2\alpha$ C) $\operatorname{tg} 2\alpha$ D) $1 + \operatorname{tg} \alpha$ E) $\operatorname{tg}^2 \alpha$
 $\frac{1 - \cos(90^\circ + 2\alpha)}{1 + \cos(90^\circ + 2\alpha)} = \frac{1 + \sin 2\alpha}{1 - \sin 2\alpha} = \frac{1 + \sin 2\alpha - (1 - \sin 2\alpha)}{1 + \sin 2\alpha + (1 - \sin 2\alpha)} =$
 $\frac{1 - \cos(90^\circ + 2\alpha) + 1}{1 + \cos(90^\circ + 2\alpha)} = \frac{1 + \sin 2\alpha}{1 - \sin 2\alpha} = \frac{1 + \sin 2\alpha + (1 - \sin 2\alpha)}{1 - \sin 2\alpha + (1 + \sin 2\alpha)} =$
 $= \frac{1 + \sin 2\alpha + 1 + \sin 2\alpha}{1 + \sin 2\alpha + 1 - \sin 2\alpha} = \frac{2 + 2 \sin 2\alpha}{2} = 1 + \sin 2\alpha$

169. İfadəni sadələşdirin: $\frac{2 \operatorname{tg}(45^\circ - \alpha)}{1 + \operatorname{tg}^2(45^\circ - \alpha)} = \sin 2(45^\circ - \alpha) =$
 A) $\cos 2\alpha$ B) $-\cos 2\alpha$ C) $\sin 2\alpha$ D) $-\sin 2\alpha$ E) $\operatorname{ctg} 2\alpha$
 $= \sin(90^\circ - 2\alpha) = \cos 2\alpha.$
 $\sin 2\alpha = \frac{\sin 2\alpha}{1} = \frac{2 \sin \alpha \cos \alpha}{\cos^2 \alpha + \sin^2 \alpha} = \frac{2 \sin \alpha \cos \alpha}{\frac{\cos^2 \alpha + \sin^2 \alpha}{\cos^2 \alpha}} = \frac{2 \operatorname{tg} \alpha}{1 + \operatorname{tg}^2 \alpha}$
 $\sin 2\alpha = \frac{2 \operatorname{tg} \alpha}{1 + \operatorname{tg}^2 \alpha}$

170. $\sin \alpha + \cos \alpha$ ifadəsini ən kiçik qiymətini tapın.
 A) 2 B) 1,5 **C) $-\sqrt{2}$** D) $\sqrt{3}$ E) 1
 $\sin \alpha + \cos \alpha = \sin \alpha + \sin(90^\circ - \alpha) = 2 \sin \frac{\alpha + 90^\circ - \alpha}{2} \cdot \cos \frac{\alpha - 90^\circ + \alpha}{2} =$
 $= 2 \sin 45^\circ \cos(\alpha - 45^\circ) = 2 \cdot \frac{\sqrt{2}}{2} \cos(\alpha - 45^\circ) = \sqrt{2} \cos(\alpha - 45^\circ)$
 $\sin \alpha + \cos \alpha = \sqrt{2} \cos(\alpha - 45^\circ) \quad \text{ƏKQ} \quad \sqrt{2} \cdot (-1) = -\sqrt{2}$

171. $\sin 2\alpha = \frac{4}{5}$ olduqda $\sin^4 \alpha + \cos^4 \alpha$ ifadəsini qiymətini tapın
 A) $\frac{9}{25}$ B) $\frac{3}{5}$ C) $\frac{13}{25}$ D) $\frac{17}{25}$ E) $\frac{25}{17}$
 $\sin^4 \alpha + \cos^4 \alpha = (\sin^2 \alpha)^2 + 2 \sin^2 \alpha \cos^2 \alpha + (\cos^2 \alpha)^2 - 2 \sin^2 \alpha \cos^2 \alpha =$
 $= (\sin^2 \alpha + \cos^2 \alpha)^2 - \frac{1}{2} \cdot 4 \sin^2 \alpha \cos^2 \alpha = 1^2 - \sin^2 2\alpha = 1 - \left(\frac{4}{5}\right)^2 = 1 - \frac{16}{25} =$
 $= \frac{9}{25}$

172. $\alpha = \frac{\pi}{8}$ olduqda $\frac{\sin \alpha + \sin 3\alpha}{\cos \alpha + \cos 3\alpha}$ ifadəsini qiymətini tapın.
 A) $\sqrt{2}$ B) $\frac{\sqrt{2}}{2}$ C) $\sqrt{3}$ **D) 1** E) -1
 $= \frac{2 \sin \frac{\alpha + 3\alpha}{2} \cos \frac{\alpha - 3\alpha}{2}}{2 \cos \frac{\alpha + 3\alpha}{2} \cos \frac{\alpha - 3\alpha}{2}} = \frac{\sin 2\alpha}{\cos 2\alpha} = \operatorname{tg} 2\alpha = \operatorname{tg} 2 \cdot \frac{\pi}{8} = \operatorname{tg} \frac{\pi}{4} = 1$

173. İfadəni sadələşdirin: $\frac{2}{\sin 4\alpha} - \operatorname{ctg} 2\alpha =$
A) $\operatorname{tg} 2\alpha$ B) $\operatorname{ctg} 2\alpha$ C) $\sin 2\alpha$ D) $\cos 2\alpha$ E) $\operatorname{tg} 4\alpha$
 $= \frac{2}{\sin 4\alpha} - \frac{\cos 2\alpha}{\sin 2\alpha} = \frac{2}{2 \sin 2\alpha \cos 2\alpha} - \frac{\cos 2\alpha}{\sin 2\alpha} = \frac{1 - \cos^2 2\alpha}{\sin 2\alpha \cos 2\alpha} =$
 $= \frac{\sin^2 2\alpha}{\sin 2\alpha \cos 2\alpha} = \frac{\sin 2\alpha}{\cos 2\alpha} = \operatorname{tg} 2\alpha$

174. İfadəni sadələşdirin: $\frac{2}{\sin 6\alpha} - \operatorname{tg} 3\alpha =$
 A) $\operatorname{ctg} 3\alpha$ **B) $\operatorname{tg} 3\alpha$** C) $\operatorname{ctg} 6\alpha$ D) $\operatorname{tg} 6\alpha$ E) $\cos 3\alpha$
 $= \frac{2}{\sin 6\alpha} - \frac{\cos 3\alpha}{\sin 3\alpha} = \frac{2}{2 \sin 3\alpha \cos 3\alpha} - \frac{\cos 3\alpha}{\sin 3\alpha} = \frac{1 - \cos^2 3\alpha}{\sin 3\alpha \cos 3\alpha} =$
 $= \frac{\sin^2 3\alpha}{\sin 3\alpha \cos 3\alpha} = \frac{\sin 3\alpha}{\cos 3\alpha} = \operatorname{tg} 3\alpha$

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175. $\sin \alpha - \cos \alpha = p$ olarsa, $\sin 2\alpha$ -ni hesablayın.
A) p^2 B) $1-p^2$ C) p^2-1 D) p^2+1 E) $p-1$

$$\begin{aligned} (\sin \alpha - \cos \alpha)^2 &= p^2 \\ \sin^2 \alpha - 2 \sin \alpha \cos \alpha + \cos^2 \alpha &= p^2 \\ 1 - \sin 2\alpha &= p^2 \\ \sin 2\alpha &= 1 - p^2 \end{aligned}$$

176. $\sin \alpha + \cos \alpha = \frac{1}{3}$ olarsa, $\sin^2 2\alpha$ -ni tapın.
A) $\frac{1}{4}$ B) $\frac{1}{9}$ C) $\frac{4}{9}$ D) $\frac{25}{36}$ E) $\frac{64}{81}$

$$\begin{aligned} (\sin \alpha + \cos \alpha)^2 &= \left(\frac{1}{3}\right)^2 \\ \sin^2 \alpha + 2 \sin \alpha \cos \alpha + \cos^2 \alpha &= \frac{1}{9} \\ 1 + \sin 2\alpha &= \frac{1}{9} \\ \sin 2\alpha &= \frac{1}{9} - 1 = -\frac{8}{9} \\ \sin^2 2\alpha &= \left(-\frac{8}{9}\right)^2 = \frac{64}{81} \end{aligned}$$

177. $\sin \alpha + \cos \alpha = \frac{1}{3}$ olarsa, $\sin 2\alpha$ -nin qiymətini tapın.
A) $\frac{2}{3}$ B) $\frac{8}{9}$ C) $-\frac{2}{3}$ D) $-\frac{8}{9}$ E) $\frac{1}{9}$

$$\begin{aligned} (\sin \alpha + \cos \alpha)^2 &= \left(\frac{1}{3}\right)^2 \\ \sin^2 \alpha + 2 \sin \alpha \cos \alpha + \cos^2 \alpha &= \frac{1}{9} \\ 1 + \sin 2\alpha &= \frac{1}{9} \\ \sin 2\alpha &= \frac{1}{9} - 1 = -\frac{8}{9} \end{aligned}$$

178. $\operatorname{tg} \alpha = 2$ olduqda $\frac{\cos^3 \alpha + \sin^3 \alpha}{\sin^3 \alpha + 3 \sin^2 \alpha \cos \alpha}$ ifadəsinin qiymətini tapın.

A) $\frac{20}{9}$ B) $\frac{9}{20}$ C) $\frac{3}{20}$ D) $\frac{3}{8}$ E) $\frac{9}{7}$

$$= \frac{\frac{\cos^3 \alpha}{\cos^3 \alpha} + \frac{\sin^3 \alpha}{\cos^3 \alpha}}{\frac{\sin^3 \alpha}{\cos^3 \alpha} + \frac{3 \sin^2 \alpha \cos \alpha}{\cos^3 \alpha}} = \frac{1 + \operatorname{tg}^3 \alpha}{\operatorname{tg}^3 \alpha + 3 \operatorname{tg} \alpha} = \frac{1 + 2^3}{2^3 + 3 \cdot 2} = \frac{9}{20}$$

179. $\operatorname{tg} \alpha = 2$ olduğunu bilərək, $\frac{3 \sin \alpha \cos \alpha + \cos^2 \alpha}{\sin^2 \alpha - 2 \cos^2 \alpha}$ ifadəsinin qiymətini tapın.

A) $\frac{2}{7}$ B) $-\frac{2}{7}$ C) $\frac{7}{2}$ D) $\frac{7}{4}$ E) $\frac{3}{2}$

$$= \frac{\frac{3 \sin \alpha \cos \alpha}{\cos^2 \alpha} + \frac{\cos^2 \alpha}{\cos^2 \alpha}}{\frac{\sin^2 \alpha}{\cos^2 \alpha} - \frac{2 \cos^2 \alpha}{\cos^2 \alpha}} = \frac{3 \operatorname{tg} \alpha + 1}{\operatorname{tg}^2 \alpha - 2} = \frac{3 \cdot 2 + 1}{2^2 - 2} = \frac{7}{2}$$

180. $\sin \alpha - \cos \alpha = \frac{1}{4}$ olarsa, $\sin 2\alpha$ -ni tapın.
A) $\frac{15}{16}$ B) $\frac{1}{16}$ C) $\frac{3}{4}$ D) $\frac{1}{2}$ E) $\frac{1}{8}$

$$\begin{aligned} (\sin \alpha - \cos \alpha)^2 &= \left(\frac{1}{4}\right)^2 \\ \sin^2 \alpha - 2 \sin \alpha \cos \alpha + \cos^2 \alpha &= \frac{1}{16} \\ 1 - \sin 2\alpha &= \frac{1}{16} \\ \sin 2\alpha &= 1 - \frac{1}{16} = \frac{15}{16} \end{aligned}$$

181. İfadəni sadələşdirin: $\sin 16^\circ + \cos 16^\circ \operatorname{tg} 37^\circ =$
A) $\sin 53^\circ$ B) $\cos 53^\circ$ C) 1 D) $\sin 43^\circ$ E) $\sin 32^\circ$

$$\begin{aligned} &= \sin 16^\circ + \cos 16^\circ \cdot \frac{\sin 37^\circ}{\cos 37^\circ} = \frac{\sin 16^\circ \cos 37^\circ + \cos 16^\circ \sin 37^\circ}{\cos 37^\circ} \\ &= \frac{\sin (16^\circ + 37^\circ)}{\cos 37^\circ} = \frac{\sin 53^\circ}{\cos 37^\circ} = \frac{\cos 37^\circ}{\cos 37^\circ} = 1 \end{aligned}$$

182. İfadəni sadələşdirin: $\sin 14^\circ + \cos 14^\circ \operatorname{tg} 38^\circ =$
A) -1 B) $\sin 52^\circ$ C) $\sin 24^\circ$ D) 1 E) 0,5

$$\begin{aligned} &= \sin 14^\circ + \cos 14^\circ \cdot \frac{\sin 38^\circ}{\cos 38^\circ} = \frac{\sin 14^\circ \cos 38^\circ + \cos 14^\circ \sin 38^\circ}{\cos 38^\circ} \\ &= \frac{\sin (14^\circ + 38^\circ)}{\cos 38^\circ} = \frac{\sin 52^\circ}{\sin 38^\circ} = 1 \end{aligned}$$

183. İfadəni sadələşdirin: $\frac{\sin (0,5\pi + x) + \cos (\pi - 2x)}{1 - \cos (-2x)} - 2 \cos x =$
A) 0 B) 1 C) 2 D) $\cos x$ E) $\sin x$

$$= \frac{\cos x - \cos 2x}{1 - \cos 2x} - 2 \cos x = \frac{-2 \sin \frac{x}{2} \sin \frac{3x}{2}}{1 - \cos^2 x + \sin^2 x} - 2 \cos x =$$

$$\frac{2 \sin x \sin x}{2 \sin^2 x} - 2 \cos x = \frac{2 \sin x \cos x}{\sin x} - 2 \cos x = 2 \cos x - 2 \cos x = 0$$

184. $\alpha + \beta = 60^\circ$ və $\alpha - \beta = 30^\circ$ olduğunu bilərək, $\frac{\operatorname{tg}^2 \alpha - \operatorname{tg}^2 \beta}{1 - \operatorname{tg}^2 \alpha \operatorname{tg}^2 \beta}$ ifadəsini sadələşdirin.
A) $\sqrt{3}$ B) $-\sqrt{3}$ C) -1 D) 1 E) 0

$$\begin{aligned} &= \frac{(\operatorname{tg} \alpha - \operatorname{tg} \beta)(\operatorname{tg} \alpha + \operatorname{tg} \beta)}{(\operatorname{tg} \alpha \operatorname{tg} \beta)(1 - \operatorname{tg} \alpha \operatorname{tg} \beta)} = \frac{\operatorname{tg} \alpha - \operatorname{tg} \beta}{\operatorname{tg} \alpha \operatorname{tg} \beta} \cdot \frac{\operatorname{tg} \alpha + \operatorname{tg} \beta}{1 - \operatorname{tg} \alpha \operatorname{tg} \beta} = \operatorname{tg}(\alpha - \beta) \operatorname{tg}(\alpha + \beta) \\ &= \operatorname{tg} 30^\circ \operatorname{tg} 60^\circ = \frac{\sqrt{3}}{3} \cdot \sqrt{3} = \frac{\sqrt{3}^2}{3} = \frac{3}{3} = 1 \end{aligned}$$

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185. $\alpha = -\frac{\pi}{3}$ olduqda $\frac{\sin 2\alpha + \cos \alpha}{\cos^2 \alpha + \sin^2 \alpha + 2 \sin \alpha}$ ifadəsinin qiymətini tapın.

- A) $-\frac{1}{2}$ B) $\frac{1}{2}$ C) $-\frac{\sqrt{3}}{2}$ D) $\frac{\sqrt{3}}{2}$ E) 0

$$\begin{aligned} &= \frac{2 \sin \alpha \cos \alpha + \cos \alpha}{1 + 2 \sin \alpha} = \frac{\cos \alpha (2 \sin \alpha + 1)}{1 + 2 \sin \alpha} = \cos \alpha = \cos\left(-\frac{\pi}{3}\right) = \\ &= \cos \frac{\pi}{3} = \frac{1}{2} \end{aligned}$$

186. $\alpha = -\frac{\pi}{6}$ olduqda $\frac{\sin \alpha - 0,5 \sin 2\alpha \cos \alpha}{\sin^2 \alpha}$ ifadəsinin qiymətini tapın.

- A) 1 B) -1 C) $\frac{1}{2}$ D) $-\frac{1}{2}$ E) 0

$$\begin{aligned} &= \frac{\sin \alpha - 0,5 \cdot 2 \sin \alpha \cos \alpha \cos \alpha}{\sin^2 \alpha} = \frac{\sin \alpha (1 - \cos^2 \alpha)}{\sin^2 \alpha} = \frac{\sin \alpha \cdot \sin^2 \alpha}{\sin^2 \alpha} = \sin \alpha = \\ &= \sin\left(-\frac{\pi}{6}\right) = -\sin \frac{\pi}{6} = -\frac{1}{2} \end{aligned}$$

187. $\cos \alpha = \frac{1}{9}$ və $\pi < \alpha < 2\pi$ olduqda $\sin \frac{\alpha}{2}$ -ni tapın.

- A) $\frac{1}{3}$ B) $\frac{\sqrt{2}}{2}$ C) $\frac{3}{4}$ D) $-\frac{1}{3}$ E) $\frac{2}{3}$

$$\pi < \alpha < 2\pi \Rightarrow \frac{\pi}{2} < \frac{\alpha}{2} < \pi \quad \frac{\alpha}{2} \in \text{II}. \quad \sin \frac{\alpha}{2} > 0.$$

$$\sin \frac{\alpha}{2} = \sqrt{\frac{1 - \cos \alpha}{2}} = \sqrt{\frac{1 - \frac{1}{9}}{2}} = \sqrt{\frac{\frac{8}{9}}{2}} = \sqrt{\frac{8}{18}} = \sqrt{\frac{4}{9}} = \frac{2}{3}$$

188. α, β və γ üçbucağın bucaqları olarsa, $\sin \alpha \cos \beta + \cos \alpha \sin \beta$ ifadəsi aşağıdakılardan hansına bərabərdir?

- A) $\sin \gamma$ B) $\cos \gamma$ C) $\operatorname{tg} \gamma$ D) $\operatorname{ctg} \gamma$ E) $\sin \gamma + \cos \gamma$

$$\alpha + \beta + \gamma = 180^\circ \Rightarrow \alpha + \beta = 180^\circ - \gamma$$

$$\sin \alpha \cos \beta + \cos \alpha \sin \beta = \sin(\alpha + \beta) = \sin(180^\circ - \gamma) = \sin \gamma$$

189. α, β, γ üçbucağın bucaqları olarsa, $\sin \alpha \sin \beta - \cos \alpha \cos \beta$ ifadəsini sadələşdirin.

- A) $\cos \gamma$ B) $\sin \gamma$ C) $\cos(\alpha - \beta)$
D) $\sin(\alpha - \beta)$ E) $\cos(\gamma - \alpha - \beta)$

$$\begin{aligned} \sin \alpha \sin \beta - \cos \alpha \cos \beta &= -(\cos \alpha \cos \beta - \sin \alpha \sin \beta) = \\ &= -\cos(\alpha + \beta) = -\cos(180^\circ - \gamma) = -(-\cos \gamma) = \cos \gamma \end{aligned}$$

190. $\cos \alpha = \frac{1}{\sqrt{m}}$ olarsa, $3 + 4 \cos 2\alpha + \cos 4\alpha$ -ni tapın.

- A) $\frac{1}{m}$ B) $\frac{4}{\sqrt{m}}$ C) $\frac{4}{m}$ D) $\frac{8}{m^2}$ E) $\frac{8}{m}$

$$\begin{aligned} 3 + 4 \cos 2\alpha + \cos 4\alpha &= 3 + 4(2 \cos^2 \alpha - 1) + (2 \cos^2 2\alpha - 1) = \\ &= 3 + 8 \cos^2 \alpha - 4 + 2(2 \cos^2 \alpha - 1)^2 - 1 = 3 + 8 \cos^2 \alpha - 4 + 8 \cos^4 \alpha - 8 \cos^2 \alpha + 2 - 1 = \\ &= 8 \cos^4 \alpha = 8 \left(\frac{1}{\sqrt{m}}\right)^4 = 8 \cdot \frac{1}{m} = \frac{8}{m} \end{aligned}$$

191. $\operatorname{tg} \alpha = 2, \operatorname{tg} \beta = 3$ və α, β müsbət iti bucaqlar olarsa, $(\alpha + \beta)$ -ni tapın.

- A) 45° B) 75° C) 105° D) 135° E) 165°

$$\operatorname{tg}(\alpha + \beta) = \frac{\operatorname{tg} \alpha + \operatorname{tg} \beta}{1 - \operatorname{tg} \alpha \operatorname{tg} \beta} = \frac{2 + 3}{1 - 2 \cdot 3} = \frac{5}{-5} = -1.$$

$$\operatorname{tg}(\alpha + \beta) = -1 \quad \alpha + \beta = 135^\circ$$

192. $\operatorname{ctg} \alpha = \frac{1}{2}, \operatorname{ctg} \beta = \frac{1}{3}$ və α, β müsbət iti bucaqlar olarsa,

- ($\alpha + \beta$)-ni tapın

- A) $\frac{3}{4}\pi$ B) $\frac{\pi}{4}$ C) $\frac{5}{6}\pi$ D) $\frac{2}{3}\pi$ E) π

$$\operatorname{ctg} \alpha = \frac{1}{2} \Rightarrow \operatorname{tg} \alpha = 2, \quad \operatorname{ctg} \beta = \frac{1}{3} \Rightarrow \operatorname{tg} \beta = 3$$

$$\operatorname{tg}(\alpha + \beta) = \frac{\operatorname{tg} \alpha + \operatorname{tg} \beta}{1 - \operatorname{tg} \alpha \operatorname{tg} \beta} = \frac{2 + 3}{1 - 2 \cdot 3} = \frac{5}{-5} = -1$$

$$\operatorname{tg}(\alpha + \beta) = -1 \\ \alpha + \beta = \frac{3\pi}{4}$$

193. $\cos \alpha = \sqrt{a}$ olduqda $5 - 6 \cos 2\alpha + \cos 4\alpha$ ifadəsinin qiymətini hesablayın.

- A) $8a^2 - 20a + 12$ B) $8a^2 + 18a - 12$ C) $2a - 1$
D) $8a^2 - 8a + 1$ E) $1 - 5a$

$$\begin{aligned} 5 - 6 \cos 2\alpha + \cos 4\alpha &= 5 - 6(2 \cos^2 \alpha - 1) + 2 \cos^2 2\alpha - 1 = \\ &= 5 - 12 \cos^2 \alpha + 6 + 2(2 \cos^2 \alpha - 1)^2 - 1 = 5 - 12 \cos^2 \alpha + 6 + 8 \cos^4 \alpha - 8 \cos^2 \alpha + 2 - 1 = \\ &= 8 \cos^4 \alpha - 20 \cos^2 \alpha + 12 = 8 \sqrt{a}^4 - 20 \sqrt{a}^2 + 12 = 8a^2 - 20a + 12 \end{aligned}$$

194. Hesablayın: $\sin 195^\circ =$

- A) $-\frac{\sqrt{6} + \sqrt{2}}{4}$ B) $\frac{\sqrt{2} - \sqrt{6}}{4}$ C) $\frac{\sqrt{6} - \sqrt{2}}{4}$
D) $\frac{\sqrt{2} - 1}{2}$ E) $\frac{1 - \sqrt{5}}{2}$

$$\begin{aligned} &= \sin(180^\circ + 15^\circ) = -\sin 15^\circ = -\sin(45^\circ - 30^\circ) = \\ &= -(\sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ) = -\left(\frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \frac{1}{2}\right) = \\ &= -\frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{2} - \sqrt{6}}{4} \end{aligned}$$

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195. Hesablayın: $\cos \frac{\pi}{5} + \cos \frac{3\pi}{5} = \cos 36^\circ + \cos 108^\circ =$
 A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{3}{4}$ D) $-\frac{1}{2}$ E) $-\frac{1}{4}$

$$= 2 \cos \frac{36^\circ + 108^\circ}{2} \cos \frac{108^\circ - 36^\circ}{2} = 2 \cos 72^\circ \cos 36^\circ =$$

$$= \frac{2 \sin 36^\circ \cos 36^\circ \cos 72^\circ}{\sin 36^\circ} = \frac{2 \sin 72^\circ \cos 72^\circ}{2 \sin 36^\circ} = \frac{\sin 144^\circ}{2 \sin 36^\circ} =$$

$$= \frac{\sin(180^\circ - 36^\circ)}{2 \sin 36^\circ} = \frac{\sin 36^\circ}{2 \sin 36^\circ} = \frac{1}{2}$$

196. Hesablayın: $\frac{2 \cos 40^\circ - \cos 20^\circ}{\sin 20^\circ} = \frac{\cos 40^\circ + \cos 40^\circ - \cos 20^\circ}{\sin 20^\circ} =$
 A) 3 B) $\sqrt{3}$ C) 2 D) $\sqrt{2}$ E) 1

$$= \frac{\cos 40^\circ - 2 \sin \frac{40^\circ + 20^\circ}{2} \sin \frac{40^\circ - 20^\circ}{2}}{\sin 20^\circ} = \frac{\cos 40^\circ - 2 \sin 30^\circ \sin 10^\circ}{\sin 20^\circ} =$$

$$= \frac{\cos 40^\circ - 2 \cdot \frac{1}{2} \sin 20^\circ}{\sin 20^\circ} = \frac{\cos 40^\circ - \cos 20^\circ}{\sin 20^\circ} = \frac{-2 \sin \frac{40^\circ + 20^\circ}{2} \sin \frac{40^\circ - 20^\circ}{2}}{\sin 20^\circ} =$$

$$= \frac{-2 \sin 30^\circ \sin 10^\circ}{\sin 20^\circ} = \frac{-2 \cdot \frac{1}{2} \sin 20^\circ}{\sin 20^\circ} = -1$$

197. $f(x) = \sin^3 4x \cos 4x + \cos^3 4x \sin 4x$ funksiyasının ən kiçik müsbət dövrünü tapın.
 A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) 2π D) π E) $\frac{3\pi}{4}$

$$f(x) = \sin 4x \cos 4x (\sin^2 4x + \cos^2 4x) = \frac{1}{2} \sin 8x \cdot 1 = \frac{1}{2} \sin 8x$$

$$T = \frac{2\pi}{8} = \frac{\pi}{4}$$

198. Funksiyanın ən kiçik müsbət dövrünü tapın:

$f(x) = \sin^3 8x \cos 8x + \cos^3 8x \sin 8x$
 A) $\frac{\pi}{16}$ B) 2π C) π D) $\frac{\pi}{8}$ E) $\frac{\pi}{4}$

$$f(x) = \sin 8x \cos 8x (\sin^2 8x + \cos^2 8x) = \frac{1}{2} \sin 16x \cdot 1$$

$$f(x) = \frac{1}{2} \sin 16x \quad T = \frac{2\pi}{16} = \frac{\pi}{8}$$

199. x -in hansı qiymətlərində $2tg^2 x + 4tg x + 5$ ifadəsi ən kiçik qiymət alır?

A) $\frac{\pi}{4}$ B) 0 C) $\frac{\pi}{4} \cdot (4m - 1), m \in Z$
 D) $\frac{\pi}{4} + \pi m, m \in Z$ E) $-\frac{\pi}{4} \cdot (2m - 1), m \in Z$

parabolunun təpə nöqtəsinin absisi $n = \frac{-b}{2a} = \frac{-4}{2 \cdot 2} = -1$

$$tg x = -1$$

$$x = -\frac{\pi}{4} + \pi m, m \in Z$$

$$x = \frac{\pi}{4} \cdot (4m - 1), m \in Z.$$

200. Sadələşdirin: $\frac{tg \alpha}{tg 2\alpha - tg \alpha} =$
 A) $2tg^2 \alpha$ B) $\sin^2 \alpha$ C) $\sin \alpha$ D) $\cos \alpha$ E) $\cos 2\alpha$

$$= \frac{\frac{\sin \alpha}{\cos \alpha}}{\frac{\sin 2\alpha}{\cos 2\alpha} - \frac{\sin \alpha}{\cos \alpha}} = \frac{\frac{\sin \alpha}{\cos \alpha}}{\frac{\sin 2\alpha \cos \alpha - \cos 2\alpha \sin \alpha}{\cos 2\alpha \cos \alpha}} = \frac{\sin \alpha}{\cos \alpha} \cdot \frac{\cos 2\alpha \cos \alpha}{\sin 2\alpha \cos \alpha - \cos 2\alpha \sin \alpha} =$$

$$= \frac{\sin \alpha}{\cos \alpha} \cdot \frac{\cos 2\alpha \cos \alpha}{\cos 2\alpha \cos \alpha - \cos 2\alpha \sin \alpha} = \frac{\sin \alpha}{\cos \alpha} \cdot \frac{\cos 2\alpha \cos \alpha}{\cos 2\alpha (\cos \alpha - \sin \alpha)} = \frac{\sin \alpha}{\cos \alpha} \cdot \frac{\cos 2\alpha \cos \alpha}{\cos 2\alpha (\cos \alpha - \sin \alpha)} = \frac{\sin \alpha}{\cos \alpha} \cdot \frac{\cos \alpha}{\cos \alpha - \sin \alpha} = \frac{\sin \alpha}{\cos \alpha - \sin \alpha}$$

201. α bucağının ikinci rübdə və $\cos \alpha = \frac{1}{5}$ olduğunu bilərək,

$ctg \left(\frac{3\pi}{2} + 2\alpha \right)$ -ni hesablayın

A) $-\frac{4\sqrt{6}}{23}$ B) $\frac{4\sqrt{6}}{23}$ C) $\frac{4\sqrt{3}}{23}$ D) $-\frac{4\sqrt{3}}{23}$ E) 1

$$ctg \left(\frac{3\pi}{2} + 2\alpha \right) = -tg 2\alpha = -\frac{\sin 2\alpha}{\cos 2\alpha} = -\frac{2 \sin \alpha \cos \alpha}{2 \cos^2 \alpha - 1} = -\frac{2 \cdot \frac{4\sqrt{6}}{23} \cdot \frac{1}{5}}{2 \cdot \left(\frac{1}{5}\right)^2 - 1} = -\frac{\frac{8\sqrt{6}}{115}}{\frac{2}{25} - 1} = -\frac{\frac{8\sqrt{6}}{115}}{-\frac{23}{25}} = \frac{8\sqrt{6}}{115} \cdot \frac{25}{23} = \frac{200\sqrt{6}}{2665} = \frac{40\sqrt{6}}{533}$$

$$\alpha \in \left[\frac{\pi}{2}, \pi \right] \quad \sin \alpha > 0$$

$$\sin \alpha = \sqrt{1 - \cos^2 \alpha} = \sqrt{1 - \left(\frac{1}{5}\right)^2} = \sqrt{1 - \frac{1}{25}} = \sqrt{\frac{24}{25}} = \frac{2\sqrt{6}}{5}$$

202. Tənliyi həll edin: $\frac{3}{7}x = (\cos 75^\circ - ctg 30^\circ \sin 75^\circ)^{\frac{1}{3}}$

A) $\frac{14}{3}$ B) $\frac{3}{14}$ C) $\frac{7}{3}$ D) $\frac{7}{3} \sin 15^\circ$ E) $\frac{3}{7} \sin 15^\circ$

$$\frac{3}{7}x = \left(\cos 45^\circ - \frac{\cos 30^\circ}{\sin 30^\circ} \cdot \sin 75^\circ \right)^{\frac{1}{3}} \quad \frac{3}{7}x = \left(\frac{-\sqrt{2}}{2} \right)^{\frac{1}{3}}$$

$$\frac{3}{7}x = \left(\frac{\cos 75^\circ \sin 30^\circ - \cos 30^\circ \sin 75^\circ}{\sin 30^\circ} \right)^{\frac{1}{3}} \quad \frac{3}{7}x = \left(\frac{-\sqrt{3}}{2} \cdot \frac{2}{7} \right)^{\frac{1}{3}}$$

$$\frac{3}{7}x = \left(\frac{\sin(30^\circ - 75^\circ)}{\sin 30^\circ} \right)^{\frac{1}{3}} \quad \frac{3}{7}x = (-\sqrt{3})^{\frac{1}{3}}$$

$$\frac{3}{7}x = \left(\frac{-\sin 45^\circ}{\sin 30^\circ} \right)^{\frac{1}{3}} \quad \frac{3}{7}x = 2$$

$$x = \frac{7 \cdot 2}{3} = \frac{14}{3}$$

203. $\sin 2\alpha = \frac{1}{5}$ olarsa $ctg^2 \left(\frac{3\pi}{4} + \alpha \right)$ -ni hesablayın.

A) $\frac{3}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{1}{2}$ D) 1 E) 2

$$ctg^2 \left(\frac{3\pi}{4} + \alpha \right) = \frac{1 + \cos \left(\frac{3\pi}{2} + 2\alpha \right)}{1 - \cos \left(\frac{3\pi}{2} + 2\alpha \right)} = \frac{1 + \sin 2\alpha}{1 - \sin 2\alpha} = \frac{1 + \frac{1}{5}}{1 - \frac{1}{5}} = \frac{\frac{6}{5}}{\frac{4}{5}} = \frac{6}{4} = \frac{3}{2}$$

204. Sadələşdirin: $\frac{2ctg \alpha}{1 + ctg^2 \alpha} = \frac{2 \cdot \frac{\cos \alpha}{\sin \alpha}}{1 + \frac{\cos^2 \alpha}{\sin^2 \alpha}} = \frac{2 \cos \alpha}{\sin \alpha} \cdot \frac{\sin^2 \alpha}{1 + \cos^2 \alpha} = \sin 2\alpha$

A) $\sin 2\alpha$ B) $\cos 2\alpha$ C) $\sin \alpha$
 D) $\cos \alpha$ E) $ctg \alpha$

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205. Sadələşdirin: $\sin^2 3 + \sin^2 1 + \cos 2 \cdot \cos 4 =$

- (A) 1 B) -1 C) $\frac{1}{2}$ D) $\sin 4$ E) $2 \sin 2$

$$\begin{aligned} &= \sin^2 3 + \sin^2 1 + \frac{1}{2} (\cos(2+4) + \cos(2-4)) = \\ &= \sin^2 3 + \sin^2 1 + \frac{1}{2} \cos 6 + \frac{1}{2} \cos 2 = \\ &= \frac{1 - \cos 6}{2} + \frac{1 - \cos 2}{2} + \frac{\cos 6}{2} + \frac{\cos 2}{2} = \frac{1 - \cos 6 + 1 - \cos 2 + \cos 6 + \cos 2}{2} = \\ &= \frac{2}{2} = 1 \end{aligned}$$

206. Sadələşdirin: $\cos^2 3 + \cos^2 1 + \cos 4 \cdot \cos 2 =$

- (A) 1 B) $2 \cos 2$ C) $\frac{1}{2}$ D) $\cos 4$ E) $\cos 6$

$$\begin{aligned} &= \frac{1 + \cos 6}{2} + \frac{1 + \cos 2}{2} + \frac{1}{2} (\cos(4+2) + \cos(4-2)) = \\ &= \frac{1 + \cos 6 + 1 + \cos 2 + \cos 6 + \cos 2}{2} = \frac{2}{2} = 1 \end{aligned}$$

207. Hesablayın: $\frac{\sin 72^\circ + \sin 48^\circ}{2\sqrt{3} \cos 51^\circ \cdot \cos 39^\circ} =$

- A) $\frac{\sqrt{3}}{2}$ B) $\frac{1}{2}$ C) 1 D) $\frac{\sqrt{2}}{2}$ E) 2

$$\begin{aligned} &= \frac{2 \sin \frac{72^\circ + 48^\circ}{2} \cdot \cos \frac{72^\circ - 48^\circ}{2}}{2\sqrt{3} \cdot \frac{1}{2} (\cos(51^\circ + 39^\circ) + \cos(51^\circ - 39^\circ))} = \frac{2 \sin 60^\circ \cos 12^\circ}{\sqrt{3} (\cos 90^\circ + \cos 12^\circ)} = \\ &= \frac{2 \cdot \frac{\sqrt{3}}{2} \cdot \cos 12^\circ}{\sqrt{3} (0 + \cos 12^\circ)} = \frac{\sqrt{3} \cos 12^\circ}{\sqrt{3} \cos 12^\circ} = 1 \end{aligned}$$

208. Sadələşdirin: $\frac{\operatorname{tg} 2\alpha \operatorname{tg} \alpha}{\operatorname{tg} 2\alpha - \operatorname{tg} \alpha} =$

- A) $\sin \alpha$ B) $\sin 2\alpha$ C) $\cos \alpha$
D) $\cos 2\alpha$ E) $\operatorname{tg} \alpha$

$$\begin{aligned} &= \frac{\frac{\sin 2\alpha \cdot \sin \alpha}{\cos 2\alpha \cdot \cos \alpha}}{\frac{\sin 2\alpha}{\cos 2\alpha} - \frac{\sin \alpha}{\cos \alpha}} = \frac{\frac{\sin 2\alpha \cdot \sin \alpha}{\cos 2\alpha \cdot \cos \alpha}}{\frac{\sin 2\alpha \cos \alpha - \cos 2\alpha \sin \alpha}{\cos 2\alpha \cdot \cos \alpha}} = \frac{\sin 2\alpha \cdot \sin \alpha}{\sin(2\alpha - \alpha)} = \\ &= \frac{\sin 2\alpha \cdot \sin \alpha}{\cos 2\alpha \cdot \cos \alpha} = \sin 2\alpha \end{aligned}$$

209. Hesablayın: $\cos 10^\circ \cdot \sin 20^\circ \sin 70^\circ - \frac{1}{4} \cos 40^\circ =$

- A) $\frac{1}{2}$ B) $\frac{1}{4}$ C) $-\frac{1}{2}$ D) $\frac{1}{8}$ E) $\frac{\sqrt{3}+1}{4}$

$$\begin{aligned} &= \cos 10^\circ \cdot \frac{1}{2} (\cos(20^\circ + 70^\circ) - \cos(20^\circ - 70^\circ)) - \frac{1}{4} \cos 40^\circ = \\ &= -\frac{1}{2} \cos 10^\circ (\cos 90^\circ - \cos 50^\circ) - \frac{1}{4} \cos 40^\circ = \frac{1}{2} \cos 10^\circ \cos 50^\circ - \frac{1}{4} \cos 40^\circ = \\ &= \frac{1}{2} \cdot \frac{1}{2} (\cos(10^\circ + 50^\circ) + \cos(10^\circ - 50^\circ)) - \frac{1}{4} \cos 40^\circ = \\ &= \frac{1}{4} \cos 60^\circ + \frac{1}{4} \cos 40^\circ - \frac{1}{4} \cos 40^\circ = \frac{1}{4} \cdot \frac{1}{2} = \frac{1}{8} \end{aligned}$$

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210. Sadələşdirin: $\frac{\sin 4\alpha}{\cos^2 \alpha - \sin^2 \alpha} = \frac{\sin 4\alpha}{(\cos^2 \alpha + \sin^2 \alpha)(\cos 2\alpha - \sin 2\alpha)}$

(A) $2 \sin 2\alpha$ B) $2 \cos 2\alpha$ C) $\sin 2\alpha$ D) $\cos 2\alpha$ E) $\sin \alpha$

$$= \frac{2 \sin 2\alpha \cdot \cos 2\alpha}{1 \cdot \cos 2\alpha} = 2 \sin 2\alpha$$

211. Hesablayın: $\frac{\cos^2 37^\circ - \sin^2 23^\circ}{\cos 14^\circ} = \frac{1 + \cos 74^\circ - 1 - \cos 46^\circ}{2 \cos 14^\circ} =$

(A) $\frac{1}{2}$ B) $\frac{\sqrt{3}}{2}$ C) $\frac{\sqrt{3}}{4}$ D) $\sqrt{3}$ E) 3

$$\begin{aligned} &= \frac{2 \cos 74^\circ - 2 \cos 46^\circ}{2 \cos 14^\circ} = \frac{\cos 74^\circ - \cos 46^\circ}{\cos 14^\circ} = \frac{2 \cos \frac{74^\circ + 46^\circ}{2} \cdot \cos \frac{74^\circ - 46^\circ}{2}}{2 \cos 14^\circ} = \\ &= \frac{2 \cos 60^\circ \cdot \cos 14^\circ}{2 \cos 14^\circ} = \cos 60^\circ = \frac{1}{2} \end{aligned}$$

212. Hesablayın: $\frac{\cos 20^\circ}{\cos^2 40^\circ - \sin^2 20^\circ} =$

- A) 1 B) $\frac{2}{\sqrt{3}}$ C) $\frac{4}{\sqrt{3}}$ D) $\frac{1}{2}$ E) 2

$$\begin{aligned} &= \frac{\cos 20^\circ}{\frac{1 + \cos 80^\circ}{2} - \frac{1 - \cos 40^\circ}{2}} = \frac{\cos 20^\circ}{\frac{1 + \cos 80^\circ - 1 + \cos 40^\circ}{2}} = \frac{2 \cos 20^\circ}{2 \cos 60^\circ \cdot \cos 20^\circ} = \\ &= \frac{\cos 20^\circ}{\cos 60^\circ \cdot \cos 20^\circ} = \frac{1}{\frac{1}{2}} = 2 \end{aligned}$$

213. Hesablayın: $\sin^2 \frac{\pi}{13} + \sin^2 \frac{11\pi}{26} = \sin^2 \frac{\pi}{13} + \sin^2 (\frac{\pi}{2} - \frac{\pi}{13}) = \sin^2 \frac{\pi}{13} + \cos^2 \frac{\pi}{13} = 1$

- A) 0,75 B) 0,5 C) 1,25 D) 1 E) 0,8

$$\frac{\pi}{13} + \frac{11\pi}{26} = \frac{2\pi + 11\pi}{26} = \frac{13\pi}{26} = \frac{\pi}{2} \Rightarrow \frac{1\pi}{26} = \frac{\pi}{2} - \frac{\pi}{13}$$

214. Hesablayın: $\cos^2 \frac{3\pi}{24} + \cos^2 \frac{7\pi}{24} = \cos^2 \frac{13\pi}{24} + \cos^2 (\frac{\pi}{2} - \frac{13\pi}{24}) = \cos^2 \frac{13\pi}{24} + \sin^2 \frac{13\pi}{24} = 1$

- A) 0,5 B) 0,75 C) 0,8 D) 1 E) 1,2

$$\frac{3\pi}{24} + \frac{7\pi}{24} = \frac{3\pi + 7\pi}{24} = \frac{10\pi}{24} = \frac{5\pi}{12} \Rightarrow \frac{7\pi}{24} = \frac{5\pi}{12} - \frac{3\pi}{24}$$

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215. Hesablayın: $(\sin 45^\circ - \sin 15^\circ) \cos 15^\circ =$

- A) $\frac{1}{4}$ B) $\frac{1}{2}$ C) $\frac{\sqrt{3}}{4}$ D) $\sqrt{3}$ E) $\sqrt{3}-1$

$$= 2 \cos \frac{45^\circ+15^\circ}{2} \cdot \sin \frac{45^\circ-15^\circ}{2} \cdot \cos 15^\circ = 2 \cos 30^\circ \cdot \sin 15^\circ \cdot \cos 15^\circ =$$

$$= 2 \cos 30^\circ \cdot \sin 30^\circ = \frac{1}{2} \sin 60^\circ = \frac{1}{2} \cdot \frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{4}$$

216. Hesablayın: $(\sin 45^\circ + \sin 15^\circ) \sin 15^\circ =$

- A) $\frac{1}{2}$ B) 1 C) $\sqrt{2}$ D) $\frac{1}{4}$ E) $\sqrt{2}-1$

$$= 2 \sin \frac{45^\circ+15^\circ}{2} \cdot \cos \frac{45^\circ-15^\circ}{2} \cdot \sin 15^\circ =$$

$$= 2 \sin 30^\circ \cdot \cos 15^\circ \cdot \sin 15^\circ = \sin 30^\circ \cdot \sin 30^\circ = \sin^2 30^\circ =$$

$$= \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$

217. İfadəni sadələşdirin: $1 + \sin \alpha - 2 \cos^2 \left(\frac{\pi}{4} - \frac{\alpha}{2}\right) =$

- A) $\cos \alpha + \sin \alpha$ B) $\sin \alpha - \cos \alpha$ C) $4 \cos^2 \left(\frac{\pi}{4} - \frac{\alpha}{2}\right)$
D) $-4 \cos^2 \left(\frac{\pi}{4} - \frac{\alpha}{2}\right)$ E) 0

$$= 1 + \sin \alpha - 2 \cdot \frac{1 + \cos \left(\frac{\pi}{2} - \alpha\right)}{2} = 1 + \sin \alpha - 1 - \sin \alpha = 0$$

218. İfadəni sadələşdirin: $1 - \sin \alpha - 2 \sin^2 \left(\frac{\pi}{4} - \frac{\alpha}{2}\right) =$

- A) 0 B) $\cos \alpha - \sin \alpha$ C) $\sin \alpha - \cos \alpha$
D) $4 \sin^2 \left(\frac{\pi}{4} - \frac{\alpha}{2}\right)$ E) $-4 \sin^2 \left(\frac{\pi}{4} - \frac{\alpha}{2}\right)$

$$= 1 - \sin \alpha - 2 \cdot \frac{1 - \cos \left(\frac{\pi}{2} - \alpha\right)}{2} = 1 - \sin \alpha - 1 + \sin \alpha = 0$$

219. Sadələşdirin: $\operatorname{tg} \frac{\alpha}{2} + \frac{\sin \alpha}{1 - \cos \alpha} = \operatorname{tg} \frac{\alpha}{2} + \frac{2 \sin \frac{\alpha}{2} \cdot \cos \frac{\alpha}{2}}{1 - \cos^2 \frac{\alpha}{2} + \sin^2 \frac{\alpha}{2}} =$

- A) $2 \operatorname{tg} \frac{\alpha}{2}$ B) $2 \operatorname{tg} \alpha$ C) $2 \operatorname{ctg} \alpha$ D) $\operatorname{ctg} \alpha$ E) $\operatorname{tg} \alpha$ F) $\frac{1}{\sin \alpha}$

$$= \operatorname{tg} \frac{\alpha}{2} + \frac{2 \sin \frac{\alpha}{2} \cdot \cos \frac{\alpha}{2}}{2 \sin^2 \frac{\alpha}{2}} = \frac{\sin \frac{\alpha}{2}}{\cos \frac{\alpha}{2}} + \frac{\cos \frac{\alpha}{2}}{\sin \frac{\alpha}{2}} = \frac{\sin^2 \frac{\alpha}{2} + \cos^2 \frac{\alpha}{2}}{\sin \frac{\alpha}{2} \cdot \cos \frac{\alpha}{2}} =$$

$$= \frac{1}{2 \sin \frac{\alpha}{2} \cdot \cos \frac{\alpha}{2}} = \frac{1}{\sin \alpha}$$

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220. Sadələşdirin: $\operatorname{ctg} \frac{\alpha}{2} + \frac{\sin \alpha}{1 + \cos \alpha} =$

- A) $2 \operatorname{ctg} \frac{\alpha}{2}$ B) $2 \operatorname{ctg} \alpha$ C) $2 \operatorname{tg} \alpha$ D) $\operatorname{tg} \alpha$ E) $\operatorname{ctg} \alpha$ F) $\frac{1}{\sin \alpha}$

$$= \frac{2 \cos^2 \frac{\alpha}{2} \cdot \sin \frac{\alpha}{2}}{2 \sin \frac{\alpha}{2} \cdot \sin \frac{\alpha}{2}} + \frac{\sin \alpha}{1 + \cos \alpha} = \frac{\sin \alpha}{2 \sin^2 \frac{\alpha}{2} - 1 + 1} + \frac{\sin \alpha}{1 + \cos \alpha} =$$

$$= \frac{\sin \alpha}{1 - 2 \sin^2 \frac{\alpha}{2}} + \frac{\sin \alpha}{1 + \cos \alpha} = \frac{\sin \alpha}{1 - \cos \alpha} + \frac{\sin \alpha}{1 + \cos \alpha} =$$

$$= \frac{\sin \alpha (1 + \cos \alpha) + \sin \alpha (1 - \cos \alpha)}{(1 - \cos \alpha)(1 + \cos \alpha)} = \frac{\sin \alpha + \sin \alpha \cos \alpha + \sin \alpha - \sin \alpha \cos \alpha}{1 - \cos^2 \alpha} = \frac{2 \sin \alpha}{\sin^2 \alpha} = \frac{2}{\sin \alpha}$$

221. İfadənin qiymətini tapın:

$$\left(\sqrt{\frac{6 \cos 25^\circ \cos 65^\circ}{\cos 40^\circ}} + 1 \right) (\sqrt{3} - 1) = \left(\sqrt{\frac{6 \cos 25^\circ \sin 25^\circ}{\cos 40^\circ}} + 1 \right) (\sqrt{3} - 1) =$$

- A) 1 B) $\sqrt{3}$ C) 2 D) $\sqrt{3} + 1$ E) 1,5

$$= \left(\sqrt{\frac{3 \sin 50^\circ}{\sin 50^\circ}} + 1 \right) (\sqrt{3} - 1) = (\sqrt{3} + 1) (\sqrt{3} - 1) = \sqrt{3}^2 - 1^2 = 3 - 1 = 2$$

222. İfadənin qiymətini tapın:

$$\left(\sqrt{\frac{4 \sin 25^\circ \sin 65^\circ}{\cos 40^\circ}} - 1 \right) (\sqrt{2} + 1) = \left(\sqrt{\frac{4 \sin 25^\circ \cos 25^\circ}{\cos 40^\circ}} - 1 \right) (\sqrt{2} + 1) =$$

- A) 1,5 B) 0,5 C) $\sqrt{2}$ D) 1 E) $\sqrt{2} + 1$

$$= \left(\sqrt{\frac{2 \sin 50^\circ}{\sin 50^\circ}} - 1 \right) (\sqrt{2} + 1) = (\sqrt{2} - 1) (\sqrt{2} + 1) = \sqrt{2}^2 - 1^2 = 2 - 1 = 1$$

223. Sadələşdirin: $\operatorname{ctg} \left(\frac{\pi}{4} + \frac{\alpha}{2}\right) \cdot \frac{1 + \sin \alpha}{\cos \alpha} = \frac{1 + \cos \left(\frac{\pi}{2} + \alpha\right)}{1 - \cos \left(\frac{\pi}{2} + \alpha\right)} \cdot \frac{1 + \sin \alpha}{\cos \alpha} =$

- A) -1 B) $\frac{\cos^2 \alpha}{1 + \sin 2\alpha}$ C) $\frac{\cos \alpha}{1 + \sin \alpha}$ D) $\frac{1 + \sin \alpha}{\cos \alpha}$ E) 1

$$= \sqrt{\frac{1 - \sin \alpha}{1 + \sin \alpha}} \cdot \frac{(1 + \sin \alpha)^2}{\cos^2 \alpha} = \sqrt{\frac{1 - \sin \alpha}{\cos^2 \alpha}} = \sqrt{\frac{\cos^2 \alpha}{\cos^2 \alpha}} = \sqrt{1} = 1$$

224. Sadələşdirin: $\operatorname{tg} \left(\frac{\pi}{4} + \frac{\alpha}{2}\right) \cdot \frac{1 - \sin \alpha}{\cos \alpha} = \frac{1 - \cos \left(\frac{\pi}{2} + \alpha\right)}{1 + \cos \left(\frac{\pi}{2} + \alpha\right)} \cdot \frac{1 - \sin \alpha}{\cos \alpha} =$

- A) 1 B) $\frac{\cos^2 \alpha}{1 + \sin 2\alpha}$ C) $\frac{\cos \alpha}{1 + \sin \alpha}$ D) $\frac{1 - \sin \alpha}{\cos \alpha}$ E) -1

$$= \sqrt{\frac{1 + \sin \alpha}{1 - \sin \alpha}} \cdot \frac{(1 - \sin \alpha)^2}{\cos^2 \alpha} = \sqrt{\frac{1 - \sin \alpha}{\cos^2 \alpha}} = \sqrt{\frac{\cos^2 \alpha}{\cos^2 \alpha}} = \sqrt{1} = 1$$

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225. İfadəni sadələşdirin: $4 \sin\left(\frac{\pi}{4} + 2\alpha\right) \sin\left(\frac{\pi}{4} - 2\alpha\right) =$
 A) $\cos 2\alpha$ B) $2 \cos 4\alpha + 2$ C) $2 \cos 4\alpha$
 D) $\cos 2\alpha + 2$ E) $2 \cos 2\alpha$

$$= 4 \cdot \frac{1}{2} \left(\cos\left(\frac{\pi}{4} + 2\alpha + \frac{\pi}{4} - 2\alpha\right) - \cos\left(\frac{\pi}{4} + 2\alpha - \frac{\pi}{4} + 2\alpha\right) \right) =$$

$$= -2 \left(\cos \frac{\pi}{2} - \cos 4\alpha \right) = -2(0 - \cos 4\alpha) = 2 \cos 4\alpha$$

226. İfadəni sadələşdirin: $8 \cos\left(\frac{\pi}{4} + 2\alpha\right) \cos\left(\frac{\pi}{4} - 2\alpha\right) =$
 A) $4 \cos 2\alpha + 4$ B) $4 \cos 4\alpha$ C) $4 \cos 4\alpha + 4$
 D) $8 \cos 4\alpha + 8$ E) $4 \cos 2\alpha$

$$= 8 \cdot \frac{1}{2} \left(\cos\left(\frac{\pi}{4} + 2\alpha + \frac{\pi}{4} - 2\alpha\right) + \cos\left(\frac{\pi}{4} + 2\alpha - \frac{\pi}{4} + 2\alpha\right) \right) =$$

$$= 4 \left(\cos \frac{\pi}{2} + \cos 4\alpha \right) = 4(0 + \cos 4\alpha) = 4 \cos 4\alpha$$

227. Tənliyi həll edin: $\frac{2}{9}x = (\sin 15^\circ + \operatorname{tg} 30^\circ \cdot \cos 15^\circ)^2$
 A) 1 B) 1,5 C) 2 D) 3 E) 3,5

$$\frac{2}{9}x = \left(\sin 15^\circ + \frac{\sin 30^\circ}{\cos 30^\circ} \cos 15^\circ \right)^2 \quad \frac{2}{9}x = \left(\frac{\sqrt{2}}{\sqrt{3}} \right)^2$$

$$\frac{2}{9}x = \left(\frac{\sin 15^\circ \cos 30^\circ + \sin 30^\circ \cos 15^\circ}{\cos 30^\circ} \right)^2 \quad \frac{2}{9}x = \left(\frac{\sqrt{6}}{\sqrt{3}} \right)^2$$

$$\frac{2}{9}x = \left(\frac{\sin(15^\circ + 30^\circ)}{\cos 30^\circ} \right)^2 \quad \frac{2}{9}x = \frac{3}{3}$$

$$\frac{2}{9}x = \left(\frac{\sin 45^\circ}{\cos 30^\circ} \right)^2 \quad x = \frac{3}{2} \cdot \frac{9}{2} = 3$$

$$x = 3$$

228. Hesablayın: $\frac{\sin^2 44^\circ}{\cos^2 22^\circ} + \frac{\sin^2 44^\circ}{\sin^2 22^\circ} =$
 A) 4 B) $\frac{3}{4}$ C) $\frac{1}{2}$ D) $\frac{1}{4}$ E) 1

$$= \frac{4 \sin^2 22^\circ \cos^2 22^\circ}{\cos^2 22^\circ} + \frac{4 \sin^2 22^\circ \cos^2 22^\circ}{\sin^2 22^\circ} = 4(\sin^2 \alpha + \cos^2 \alpha) = 4 \cdot 1 = 4$$

229. Hesablayın: $\frac{\sin^2 36^\circ}{\cos^2 18^\circ} + \frac{\sin^2 36^\circ}{\sin^2 18^\circ} =$
 A) $\frac{1}{2}$ B) $\frac{3}{4}$ C) $\frac{1}{4}$ D) 1 E) 4

$$= \frac{4 \sin^2 18^\circ \cos^2 18^\circ}{\cos^2 18^\circ} + \frac{4 \sin^2 18^\circ \cos^2 18^\circ}{\sin^2 18^\circ} = 4(\sin^2 \alpha + \cos^2 \alpha) = 4 \cdot 1 = 4$$

230. Hesablayın: $\frac{2 \cos 80^\circ + \cos 40^\circ}{\sin 40^\circ} = \frac{\cos 80^\circ + \cos 80^\circ + \cos 40^\circ}{\sin 40^\circ} =$
 A) 1 B) $\sqrt{2}$ C) 2 D) $\sqrt{3}$ E) 3

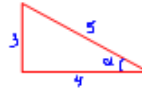
$$= \frac{\cos 80^\circ + 2 \cos \frac{80^\circ + 40^\circ}{2} \cos \frac{80^\circ - 40^\circ}{2}}{\sin 40^\circ} = \frac{\cos 80^\circ + 2 \cos 60^\circ \cos 20^\circ}{\sin 40^\circ} =$$

$$= \frac{2 \cos \frac{80^\circ + 20^\circ}{2} \cos \frac{80^\circ - 20^\circ}{2}}{\sin 40^\circ} = \frac{2 \cos 50^\circ \cos 30^\circ}{\sin 40^\circ} = 2 \cdot \frac{\sqrt{3}}{2} = \sqrt{3}$$

231. $\operatorname{tg} \alpha = \frac{3}{4}$ və $0 < \alpha < \frac{\pi}{2}$ olarsa, $\frac{1 + \frac{1}{2} \sin 2\alpha}{\cos^3 \alpha - \sin^3 \alpha}$ ifadəsinin qiymətini tapın.
 A) 4 B) 5 C) $\frac{25}{4}$ D) 6 E) 4,5

$$\frac{1 + \frac{1}{2} \cdot 2 \sin \alpha \cos \alpha}{(\cos \alpha - \sin \alpha)(\cos^2 \alpha + \cos \alpha \sin \alpha + \sin^2 \alpha)} = \frac{1 + \sin \alpha \cos \alpha}{(\cos \alpha - \sin \alpha)(1 + \sin \alpha \cos \alpha)}$$

$$= \frac{1}{\cos \alpha - \sin \alpha} = \frac{1}{\frac{4}{5} - \frac{3}{5}} = \frac{1}{\frac{1}{5}} = 5$$



232. Hesablayın: $\sin 10^\circ \cdot \sin 50^\circ \cdot \sin 70^\circ =$
 A) $\frac{1}{4}$ B) $\frac{1}{8}$ C) $-\frac{1}{8}$ D) -1 E) 0

$$= \frac{1}{2} (\cos(10^\circ + 50^\circ) - \cos(10^\circ - 50^\circ)) \cdot \sin 70^\circ = -\frac{1}{2} (\cos 60^\circ - \cos 40^\circ) \cdot \sin 70^\circ =$$

$$= -\frac{1}{2} \cdot \frac{1}{2} \sin 70^\circ + \frac{1}{2} \cos 40^\circ \sin 70^\circ = -\frac{1}{4} \cos 20^\circ + \frac{1}{2} \cos 40^\circ \sin 20^\circ =$$

$$= -\frac{1}{4} \cos 20^\circ + \frac{1}{2} \cdot \frac{1}{2} (\cos(40^\circ + 20^\circ) + \cos(40^\circ - 20^\circ)) = -\frac{1}{4} \cos 20^\circ + \frac{1}{4} \frac{1}{2} + \frac{1}{4} \cos 20^\circ = \frac{1}{8}$$

$$\sin 10^\circ \sin 50^\circ \sin 70^\circ = \frac{2 \sin 10^\circ \cos 10^\circ \sin 60^\circ \sin 70^\circ}{2 \cos 10^\circ} = \frac{2 \sin 20^\circ \cos 20^\circ \sin 40^\circ}{2 \cdot 2 \cos 10^\circ} =$$

$$= \frac{2 \sin 40^\circ \cos 40^\circ}{2 \cdot 4 \cos 10^\circ} = \frac{\sin 80^\circ}{8 \sin 80^\circ} = \frac{1}{8}$$

233. Hesablayın: $\cos 20^\circ \cdot \cos 40^\circ \cdot \cos 80^\circ =$
 A) 0 B) $\frac{1}{4}$ C) $-\frac{1}{8}$ D) $-\frac{1}{4}$ E) $\frac{1}{8}$

$$= \frac{2 \sin 20^\circ \cos 20^\circ \cos 40^\circ \cos 80^\circ}{2 \sin 20^\circ} = \frac{2 \sin 40^\circ \cos 40^\circ \cos 80^\circ}{2 \cdot 2 \sin 20^\circ} =$$

$$= \frac{2 \sin 80^\circ \cos 80^\circ}{2 \cdot 4 \sin 20^\circ} = \frac{\sin 160^\circ}{8 \sin 20^\circ} = \frac{\sin(180^\circ - 20^\circ)}{8 \sin 20^\circ} = \frac{\sin 20^\circ}{8 \sin 20^\circ} = \frac{1}{8}$$

234. Sadələşdirin: $\frac{\sqrt{2} - \sin \alpha - \cos \alpha}{\sin \alpha - \cos \alpha} =$

A) 1 B) $\cos \alpha$ C) $\sin \alpha$ D) $\operatorname{tg}\left(\frac{\alpha}{2} - \frac{\pi}{8}\right)$ E) $\operatorname{ctg}\left(\frac{\alpha}{2} - \frac{\pi}{8}\right)$

$$= \frac{\sqrt{2} - (\sin \alpha + \sin(90^\circ - \alpha))}{\sin \alpha - \sin(90^\circ - \alpha)} = \frac{\sqrt{2} - 2 \sin \frac{\alpha + 90^\circ - \alpha}{2} \cos \frac{\alpha - 90^\circ + \alpha}{2}}{\sin \alpha - \sin(90^\circ - \alpha)} =$$

$$= \frac{\sqrt{2} - 2 \sin 45^\circ \cos(\alpha - 45^\circ)}{2 \cos \frac{\alpha + 90^\circ - \alpha}{2} \sin \frac{\alpha - 90^\circ + \alpha}{2}} = \frac{\sqrt{2} - 2 \cdot \frac{\sqrt{2}}{2} \cos(\alpha - 45^\circ)}{2 \cos 45^\circ \sin(\alpha - 45^\circ)} = \frac{\sqrt{2} (1 - \cos(\alpha - 45^\circ))}{2 \cos 45^\circ \sin(\alpha - 45^\circ)} =$$

$$= \frac{1 - \cos(\alpha - 45^\circ)}{\sin(\alpha - 45^\circ)} = \frac{1 - \cos^2 \frac{\alpha - 45^\circ}{2} + \sin^2 \frac{\alpha - 45^\circ}{2}}{2 \sin \frac{\alpha - 45^\circ}{2} \cos \frac{\alpha - 45^\circ}{2}} = \frac{2 \sin^2 \frac{\alpha - 45^\circ}{2}}{2 \sin \frac{\alpha - 45^\circ}{2} \cos \frac{\alpha - 45^\circ}{2}} =$$

$$= \frac{\sin \frac{\alpha - 45^\circ}{2}}{\cos \frac{\alpha - 45^\circ}{2}} = \operatorname{tg} \frac{\alpha - 45^\circ}{2} = \operatorname{tg}\left(\frac{\alpha}{2} - \frac{\pi}{8}\right)$$

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235. $\sin \alpha - \sin \beta = 3 \sin(\alpha - \beta)$ və $\alpha - \beta \neq \pi k$ olduqda

$\operatorname{tg} \frac{\alpha}{2} \cdot \operatorname{tg} \frac{\beta}{2}$ ifadəsinin qiymətini tapın.

A) $\frac{1}{2}$ B) 1 C) 0 D) -1 **E) $-\frac{1}{2}$**

$$\sin \alpha - \sin \beta = 3 \sin(\alpha - \beta)$$

$$2 \cos \frac{\alpha + \beta}{2} \cdot \sin \frac{\alpha - \beta}{2} = 3 \cdot 2 \sin \frac{\alpha - \beta}{2} \cdot \cos \frac{\alpha - \beta}{2}$$

$$\cos \left(\frac{\alpha}{2} + \frac{\beta}{2} \right) = 3 \cos \left(\frac{\alpha}{2} - \frac{\beta}{2} \right)$$

$$\cos \frac{\alpha}{2} \cos \frac{\beta}{2} - \sin \frac{\alpha}{2} \sin \frac{\beta}{2} = 3 \cos \frac{\alpha}{2} \cos \frac{\beta}{2} + 3 \sin \frac{\alpha}{2} \sin \frac{\beta}{2}$$

$$-2 \cos \frac{\alpha}{2} \cos \frac{\beta}{2} = 4 \sin \frac{\alpha}{2} \sin \frac{\beta}{2} \Rightarrow \operatorname{tg} \frac{\alpha}{2} \cdot \operatorname{tg} \frac{\beta}{2} = -\frac{1}{2}$$

236. $\sin \alpha + \sin \beta = 2 \sin(\alpha + \beta)$ və $\alpha + \beta \neq \pi k$ olduqda

$\operatorname{tg} \frac{\alpha}{2} \cdot \operatorname{tg} \frac{\beta}{2}$ ifadəsinin qiymətini tapın.

A) 3 B) 2 C) 1 D) $\frac{1}{3}$ **E) $\frac{1}{2}$**

$$2 \sin \frac{\alpha + \beta}{2} \cos \frac{\alpha - \beta}{2} = 2 \sin(\alpha + \beta) \cos \frac{\alpha + \beta}{2}$$

$$\cos \left(\frac{\alpha}{2} - \frac{\beta}{2} \right) = 2 \cos \left(\frac{\alpha}{2} + \frac{\beta}{2} \right)$$

$$\cos \frac{\alpha}{2} \cos \frac{\beta}{2} + \sin \frac{\alpha}{2} \sin \frac{\beta}{2} = 2 \cos \frac{\alpha}{2} \cos \frac{\beta}{2} - 2 \sin \frac{\alpha}{2} \sin \frac{\beta}{2}$$

$$3 \sin \frac{\alpha}{2} \sin \frac{\beta}{2} = \cos \frac{\alpha}{2} \cos \frac{\beta}{2}$$

$$3 \cos \frac{\alpha}{2} \cos \frac{\beta}{2} = 3 \cos \frac{\alpha}{2} \cos \frac{\beta}{2}$$

$$\operatorname{tg} \frac{\alpha}{2} \cdot \operatorname{tg} \frac{\beta}{2} = \frac{1}{3}$$

237. $y = \operatorname{tg} x \cdot \sin 2x$ funksiyasının ən kiçik qiymətini tapın.

A) -2 B) 2 **C) 0** D) 1 E) -1

$$y = \operatorname{tg} x \cdot \sin 2x = \frac{\sin x}{\cos x} \cdot 2 \sin x \cos x = 2 \sin^2 x$$

$$\cos x \neq 0 \Rightarrow \sin x \neq \pm 1$$

$$\text{JKQ } (2 \sin^2 x) = 2 \cdot 0 = 0.$$

238. $\cos(45^\circ - \alpha) = \frac{1}{3}$ olduğunu bilərək, $\frac{1 + \sin 2\alpha}{\sin \alpha + \cos \alpha}$ ifadəsinin

qiymətini tapın.

A) $\frac{2}{3}$ **B) $\frac{\sqrt{2}}{3}$** C) $\frac{\sqrt{3}}{3}$ D) $\frac{1}{3}$ E) 1

$$\frac{1 + \sin 2\alpha}{\sin \alpha + \cos \alpha} = \frac{\sin^2 \alpha + \cos^2 \alpha + 2 \sin \alpha \cos \alpha}{\sin \alpha + \cos \alpha} = \frac{(\sin \alpha + \cos \alpha)^2}{\sin \alpha + \cos \alpha} =$$

$$= \sin \alpha + \sin(90^\circ - \alpha) = 2 \sin \frac{\alpha + 90^\circ - \alpha}{2} \cos \frac{\alpha - 90^\circ - \alpha}{2} = 2 \sin 45^\circ \cos(\alpha - 45^\circ)$$

$$= 2 \cdot \frac{\sqrt{2}}{2} \cdot \cos(45^\circ - \alpha) = \sqrt{2} \cdot \frac{1}{3} = \frac{\sqrt{2}}{3}$$

239. $\operatorname{tg} \alpha$ və $\operatorname{tg} \beta$ ədədləri $x^2 - 2\sqrt{5}x + 2 = 0$ tənliyinin kökləri olduğunu bilərək, $\operatorname{tg}(\alpha + \beta)$ -ni tapın.

A) $2\sqrt{5}$ B) 2 C) -2 D) $\sqrt{5}$ **E) $-2\sqrt{5}$**

Viyet teoreminə görə $\operatorname{tg} \alpha + \operatorname{tg} \beta = 2\sqrt{5}$

$$\operatorname{tg} \alpha \cdot \operatorname{tg} \beta = 2.$$

$$\operatorname{tg}(\alpha + \beta) = \frac{\operatorname{tg} \alpha + \operatorname{tg} \beta}{1 - \operatorname{tg} \alpha \operatorname{tg} \beta} = \frac{2\sqrt{5}}{1 - 2} = \frac{2\sqrt{5}}{-1} = -2\sqrt{5}$$

240. x -in hansı qiymətlərində $y = \sqrt{3} \sin 2x - \cos 2x$ funksiyası özünün ən kiçik qiymətini alır?

A) $-\frac{\pi}{6} + \pi n, n \in \mathbb{Z}$ B) $-\frac{\pi}{6} + 2\pi n, n \in \mathbb{Z}$

C) $-\frac{\pi}{3} + \pi n, n \in \mathbb{Z}$ D) $-\frac{\pi}{3} + 2\pi n, n \in \mathbb{Z}$

E) $\frac{\pi}{6} + \pi n, n \in \mathbb{Z}$

$$y = \sqrt{3} \sin 2x - \cos 2x = 2 \cdot \left(\frac{\sqrt{3}}{2} \sin 2x - \frac{1}{2} \cos 2x \right) =$$

$$= 2 (\sin 2x \cos 30^\circ - \cos 2x \sin 30^\circ) = 2 \sin(2x - 30^\circ)$$

$$y = 2 \sin(2x - 30^\circ) \quad \text{JKQ } (2 \sin(2x - 30^\circ)) = 2 \cdot (-1) = -2.$$

$$\sin(2x - 30^\circ) = -1$$

$$2x - \frac{\pi}{6} = -\frac{\pi}{2} + 2\pi m$$

$$2x = -\frac{\pi}{2} + \frac{\pi}{6} + 2\pi m$$

$$2x = -\frac{\pi}{3} + 2\pi m \quad x = -\frac{\pi}{6} + \pi m, m \in \mathbb{Z}$$

241. $-\frac{\pi}{2} < \alpha < 0$ olduqda $\operatorname{tg} \alpha + \operatorname{ctg} \alpha$ ifadəsinin ən böyük qiymətini tapın.

A) $+\infty$ B) $-\infty$ C) 0 **D) -2** E) $-\sqrt{3}$

$$\operatorname{tg} \alpha + \operatorname{ctg} \alpha = \frac{\sin \alpha}{\cos \alpha} + \frac{\cos \alpha}{\sin \alpha} = \frac{\sin^2 \alpha + \cos^2 \alpha}{\sin \alpha \cos \alpha} = \frac{2}{2 \sin \alpha \cos \alpha} = \frac{2}{\sin 2\alpha}$$

$$\text{JKQ } \left(\frac{2}{\sin 2\alpha} \right) = \lim_{\sin 2\alpha \rightarrow -1} \frac{2}{\sin 2\alpha} = \frac{2}{-1} = -2$$

242. $0 < \alpha < \frac{\pi}{2}$ olduqda $\operatorname{tg} \alpha + \operatorname{ctg} \alpha$ ifadəsinin ən kiçik qiymətini tapın.

A) 2 B) -2 C) 1 D) -1 E) 0

$$\operatorname{tg} \alpha + \operatorname{ctg} \alpha = \frac{\sin \alpha}{\cos \alpha} + \frac{\cos \alpha}{\sin \alpha} = \frac{\sin^2 \alpha + \cos^2 \alpha}{\sin \alpha \cos \alpha} = \frac{2}{2 \sin \alpha \cos \alpha} = \frac{2}{\sin 2\alpha}$$

$$\text{JKQ } \left(\frac{2}{\sin 2\alpha} \right) = \frac{2}{1} = 2$$

$$0 < \alpha < \frac{\pi}{2}$$

$$0 < 2\alpha < \pi$$

$$0 < \sin 2\alpha \leq 1$$

243. Hesablayın $\operatorname{tg}(2 \operatorname{arccctg} 5)$.

A) $\frac{4}{5}$ B) $\frac{2}{5}$ **C) $\frac{5}{12}$** D) $\frac{1}{12}$ E) $\frac{1}{5}$

$$\operatorname{tg}(2 \operatorname{arccctg} 5) = \frac{2 \operatorname{tg}(\operatorname{arccctg} 5)}{1 - \operatorname{tg}^2(\operatorname{arccctg} 5)} = \frac{2 \cdot \frac{1}{\operatorname{ctg}(\operatorname{arccctg} 5)}}{1 - \frac{1}{\operatorname{ctg}^2(\operatorname{arccctg} 5)}} = \frac{\frac{2}{5}}{1 - \frac{1}{25}} =$$

$$= \frac{2}{5} : \frac{24}{25} = \frac{2}{5} \cdot \frac{25}{24} = \frac{5}{12}$$

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244. Hesablayın: $\operatorname{tg}(2\arctg 3) =$
 A) $\frac{1}{4}$ B) $-\frac{1}{4}$ C) $\frac{3}{4}$ **D) $-\frac{3}{4}$** E) $-\frac{1}{3}$

$$= \frac{2\operatorname{tg}(\arctg 3)}{1 - \operatorname{tg}^2(\arctg 3)} = \frac{2 \cdot 3}{1 - 3^2} = \frac{6}{1 - 9} = \frac{6}{-8} = -\frac{3}{4}$$

245. $\frac{1}{\sin 170^\circ} - \frac{\sqrt{3}}{\sin 100^\circ}$ ifadəsini hesablayın
 A) 1 B) 2 **C) 4** D) $\sqrt{3} - 1$ E) $\frac{1}{2}$

$$\frac{1}{\sin(180^\circ - 10^\circ)} - \frac{\sqrt{3}}{\sin(90^\circ + 10^\circ)} = \frac{1}{\sin 10^\circ} - \frac{\sqrt{3}}{\cos 10^\circ} =$$

$$= \frac{\cos 10^\circ - \sqrt{3} \sin 10^\circ}{\sin 10^\circ \cos 10^\circ} = \frac{1 \cdot 2 \left(\frac{1}{2} \cos 10^\circ - \frac{\sqrt{3}}{2} \sin 10^\circ \right)}{2 \sin 10^\circ \cos 10^\circ} =$$

$$= \frac{4(\sin 30^\circ \cos 10^\circ - \cos 30^\circ \sin 10^\circ)}{\sin 20^\circ} = \frac{4 \sin(30^\circ - 10^\circ)}{\sin 20^\circ} = \frac{4 \sin 20^\circ}{\sin 20^\circ} = 4.$$

246. Hesablayın: $\frac{1}{2 \cos 20^\circ} - 2 \sin 50^\circ =$
 A) 0 B) 1 **C) -1** D) 0,5 E) -2

$$= \frac{1 - 4 \sin 30^\circ \cos 20^\circ}{2 \cos 20^\circ} = \frac{1 - 4 \cdot \frac{1}{2} (\sin(50^\circ + 20^\circ) + \sin(50^\circ - 20^\circ))}{2 \cos 20^\circ} =$$

$$= \frac{1 - 2(\sin 70^\circ + \sin 30^\circ)}{2 \cos 20^\circ} = \frac{1 - 2 \sin 70^\circ - 2 \cdot \frac{1}{2}}{2 \cos 20^\circ} = \frac{1 - 2 \sin 70^\circ - 1}{2 \cos 20^\circ} =$$

$$= \frac{-2 \cos 20^\circ}{2 \cos 20^\circ} = -1.$$

247. $\sin 2x (\sin^4 x - \cos^4 x) = \frac{1}{2} \sin kx$ bərabərliyi k -nın hansı qiymətində eynilik olar?
 A) 2 B) -2 C) 4 **D) -4** E) $\frac{1}{2}$

$$\sin 2x (\sin^2 x + \cos^2 x) (\sin^2 x - \cos^2 x) = \frac{1}{2} \sin kx.$$

$$\sin 2x \cdot 1 \cdot (-\cos 2x) = \frac{1}{2} \sin kx$$

$$-\frac{1}{2} \sin 2x \cos 2x = \frac{1}{2} \sin kx$$

$$-\frac{1}{2} \sin 4x = \frac{1}{2} \sin kx$$

$$\frac{1}{2} \sin(-4)x = \frac{1}{2} \sin kx$$

$k = -4$

248. k -m n hansı qiymətində $1 - \cos^4 8x + \sin^4 8x = 2 \sin^2 kx$ bərabərliyi eynilik olar?
 A) 4 **B) 8** C) 16 D) 2 E) 6

$$1 - (\cos^4 8x - \sin^4 8x) = 2 \sin^2 kx$$

$$1 - (\cos^2 8x + \sin^2 8x) \cdot (\cos^2 8x - \sin^2 8x) = 2 \sin^2 kx$$

$$1 - 1 \cdot (\cos^2 8x - \sin^2 8x) = 2 \sin^2 kx$$

$$1 - \cos^2 8x + \sin^2 8x = 2 \sin^2 kx$$

$$\sin^2 8x + \sin^2 8x = 2 \sin^2 kx$$

$$2 \sin^2 8x = 2 \sin^2 kx$$

$k = 8$

249. $\alpha = \frac{7\pi}{24}$ olduqda $\cos^4 \alpha - \sin^4 \alpha + \sin 2\alpha$ ifadəsinin qiymətini tapın

A) $\frac{\sqrt{3}}{2}$ B) $\frac{1}{2}$ C) $\sqrt{3}$ **D) $\frac{\sqrt{3}}{2}$** E) -1

$$(\cos^2 \alpha + \sin^2 \alpha)(\cos^2 \alpha - \sin^2 \alpha) + \sin 2\alpha =$$

$$= 1 \cdot \cos 2\alpha + \sin 2\alpha = \cos 2\alpha + \cos(90^\circ - 2\alpha) =$$

$$= 2 \cos \frac{2\alpha + 90^\circ - 2\alpha}{2} \cdot \cos \frac{2\alpha - 90^\circ + 2\alpha}{2} = 2 \cos 45^\circ \cdot \cos(2\alpha - 45^\circ) =$$

$$= 2 \cdot \frac{\sqrt{2}}{2} \cdot \cos\left(2 \cdot \frac{7\pi}{24} - 45^\circ\right) = \sqrt{2} \cos(105^\circ - 45^\circ) = \sqrt{2} \cos 60^\circ = \sqrt{2} \cdot \frac{1}{2} = \frac{\sqrt{2}}{2}.$$

250. Hesablayın: $2 \cos\left(2 \arccos\left(-\frac{1}{2}\right) - \arctg \sqrt{3}\right) =$
 A) -2 B) -1 C) 0 D) 1 E) 2

$$= 2 \cos(2 \cdot 120^\circ - 60^\circ) = 2 \cos 180^\circ = 2 \cdot (-1) = -2$$

251. Hesablayın: $3 \sin\left(2 \arccos\left(-\frac{\sqrt{3}}{2}\right) - \arctg \frac{\sqrt{3}}{3}\right) =$
 A) -3 B) 3 C) 1,5 D) -1,5 E) 0

$$= 3 \sin(2 \cdot 150^\circ - 30^\circ) = 3 \sin 270^\circ = 3 \cdot (-1) = -3.$$

252. Hesablayın: $\cos(\arctg(-2)) =$
 A) $-\frac{1}{\sqrt{5}}$ B) $\frac{1}{4}$ **C) $\frac{1}{\sqrt{5}}$** D) $\frac{1}{\sqrt{3}}$ E) $\frac{1}{2}$

$$\cos(\arctg(-2))$$

$$\operatorname{tg}(\arctg(-2)) = \operatorname{tg} \alpha$$

$$-2 = \operatorname{tg} \alpha$$

$$1 + \operatorname{tg}^2 \alpha = \frac{1}{\cos^2 \alpha}$$

$$\cos \alpha = \frac{1}{\sqrt{1 + \operatorname{tg}^2 \alpha}} = \frac{1}{\sqrt{1 + (-2)^2}} = \frac{1}{\sqrt{5}}$$

253. Hesablayın: $\operatorname{tg} 100^\circ \operatorname{tg} 200^\circ \operatorname{tg} 300^\circ + \operatorname{tg} 100^\circ + \operatorname{tg} 200^\circ \operatorname{tg} 300^\circ =$
 A) 1 B) -1 **C) 0** D) $\frac{1}{2}$ E) -3.

$$= \operatorname{tg} 300^\circ (\operatorname{tg} 100^\circ \operatorname{tg} 200^\circ - 1) + \operatorname{tg} 100^\circ + \operatorname{tg} 200^\circ =$$

$$= \operatorname{tg}(100^\circ + 200^\circ) \cdot (\operatorname{tg} 100^\circ \operatorname{tg} 200^\circ - 1) + \operatorname{tg} 100^\circ + \operatorname{tg} 200^\circ =$$

$$= \frac{\operatorname{tg} 100^\circ + \operatorname{tg} 200^\circ}{1 - \operatorname{tg} 100^\circ \operatorname{tg} 200^\circ} \cdot (-(1 - \operatorname{tg} 100^\circ \operatorname{tg} 200^\circ)) + \operatorname{tg} 100^\circ + \operatorname{tg} 200^\circ =$$

$$= -(\operatorname{tg} 100^\circ + \operatorname{tg} 200^\circ) + (\operatorname{tg} 100^\circ + \operatorname{tg} 200^\circ) = 0$$