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نیایش زندی

① $8\cos x = \tan^2 x + 1 \qquad \frac{1}{\cos^2 x} = 8\cos x \qquad 8\cos^3 x = 1 \qquad \cos^3 x = \frac{1}{8}$

$\cos x = \frac{1}{2}$  $\longrightarrow 2k\pi \pm \frac{\pi}{3} \xrightarrow[{[0,2\pi]}]{\text{بازه}} \left\{ \frac{\pi}{3} , \frac{5\pi}{3} \right\}$

② $5(1-\cos^2 x) + 2(4\cos^3 x - 3\cos x) = -2$

$5 - 5\cos^2 x + 8\cos^3 x - 6\cos x + 2 = 0 \longrightarrow 8\cos^3 x - 5\cos^2 x - 6\cos x + 7 = 0$

جمع ضرایب زوج و فرد با هم برابر است یکی از ریشه ها ۱- است

$8\cos^3 x - 5\cos^2 x - 6\cos x + 7 \quad \big| \ \cos x + 1$

$-8\cos^3 x \mp 8\cos^2 x \qquad 8\cos^2 x - 13\cos x + 7 \qquad 8\cos^2 x - 13\cos x + 7 = 0$

$-13\cos^2 x - 6\cos x + 7 \qquad \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{13 \pm \sqrt{169 - 4(\ldots)}}{16}$

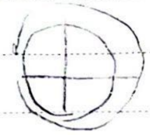
$-13\cos^2 x \mp 13\cos x$

$\Delta < 0 \Rightarrow$ در نتیجه این معادله ریشه ندارد و $\cos x = -1$ تنها جواب است.

$7\cos x + 1$

$\longrightarrow 2k\pi + \pi \xrightarrow{\text{بازه در}} [-\pi, \pi]$

0

$\left\{ -\pi , \pi \right\} \Rightarrow$ ۲ جواب 

③ $\sin x + (\sin 3x - \sin x) = 1 \qquad \sin 3x = 1 \qquad 3x = 2k\pi + \frac{\pi}{2}$

$x = \frac{\pi}{6} + \frac{2k\pi}{3} \xrightarrow[\text{خواسته شده}]{\text{جواب ها در بازه}} \left\{ \frac{\pi}{6} , \frac{5\pi}{6} , \frac{3\pi}{2} \right\} \xrightarrow{\text{مجموع}} \boxed{\frac{5\pi}{2}}$

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$$\frac{1}{\sin\left(\frac{\pi}{2}+2x\right)}+\frac{1}{\cos\left(\frac{\pi}{2}+4x\right)}=0 \longrightarrow \frac{1}{\cos 2x}+\frac{1}{-\sin 4x}=0$$ (۴)

$$\frac{-\sin 4x+\cos 2x}{\cos 2x\,\sin 4x}=0 \qquad \cos 2x-\sin 4x=0 \qquad \cos 2x=\sin 4x$$

$$\cos 2x=\cos\left(\frac{3\pi}{2}+4x\right) \qquad \sin 4x=\sin\left(\frac{\pi}{2}-2x\right)$$

$$4x=\frac{\pi}{2}-2x+2k\pi \longrightarrow x=\frac{k\pi}{3}+\frac{\pi}{12}$$

$$-4x=\pi-\left(\frac{\pi}{2}-2x\right)+2k\pi \longrightarrow x=k\pi+\frac{\pi}{4}$$

$\longrightarrow \frac{\pi}{12}, \frac{\pi}{4}, \frac{\pi}{12}+\frac{\pi}{3}, \frac{\pi}{4}+\frac{\pi}{3}$

اختلاف بزرگترین و کوچکترین جواب $=\frac{2\pi}{3}$

$$2a=\frac{4\pi}{2} \qquad \tan\left(\frac{4\pi}{3}\right)=\sqrt{3}$$

$$m(\cos x-\sin x)-6\sqrt{6}\sin x\cos x=\sqrt{6} \qquad \cos\left(x+\frac{\pi}{4}\right)=\cos x-\sin x$$ (۵)

$$\cos x-\sin x=\sqrt{\frac{2}{3}} \qquad \frac{\sqrt{2}}{2}(\cos x-\sin x)=\frac{1}{\sqrt{3}} \qquad 1-\sin^2 x=\frac{2}{3}$$

$$\sin^2 x=\frac{1}{3} \qquad m\left(\sqrt{\frac{2}{3}}\right)-6\sqrt{6}\left(\frac{1}{3}\right)=\sqrt{6} \qquad m=\frac{2\sqrt{6}}{\sqrt{\frac{2}{3}}} \qquad \boxed{m=6}$$

$$\sin\left(x+\frac{\pi}{6}\right)\times\cos\left(x+\frac{\pi}{6}-\frac{\pi}{2}\right)=1 \qquad 2\sin\left(x+\frac{\pi}{6}\right)=1$$ (۶)

$$\sin\left(x+\frac{\pi}{6}\right)=\frac{1}{2}$$

$$x+\frac{\pi}{6}=2k\pi+\frac{\pi}{6} \qquad x=2k\pi$$

$$x+\frac{\pi}{6}=2k\pi+\frac{5\pi}{6} \qquad x=2k\pi+\frac{2\pi}{3}$$

در بازه $[0,2\pi]$ ← $\left\{0,2\pi,\frac{2\pi}{3}\right\}$ ← ۳ تا

$$\frac{a}{|a|}\sqrt{a^2+b^2}\sin(x+\varphi) \xrightarrow{\tan\varphi=\frac{b}{a}} 2\sin\left(x+\frac{\pi}{3}\right)=\sqrt{3}$$ (۷)

$$\sin\left(x+\frac{\pi}{3}\right)=\frac{\sqrt{3}}{2} \qquad x+\frac{\pi}{3}=2k\pi+\frac{\pi}{4} \longrightarrow x=2k\pi+\frac{3\pi-4\pi}{12}=2k\pi-\frac{\pi}{12}$$

$$\left\{-\frac{\pi}{12},\frac{23\pi}{12},\frac{11\pi}{12}\right\} \qquad x+\frac{\pi}{3}=2k\pi+\frac{3\pi}{4} \longrightarrow x=2k\pi+\frac{9\pi-4\pi}{12}=2k\pi+\frac{11\pi}{12}$$

$$\frac{27\pi}{12}=\frac{9\pi}{4}$$

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$-2\sin^2 x = 1 \quad \sin^2 x = -\frac{1}{2}$ (۱)

$x = 2k\pi - \frac{\pi}{3} \rightarrow x = k\pi - \frac{\pi}{12}$

$x = 2k\pi - \frac{\pi}{3} \quad x = k\pi - \frac{\pi}{12}$

$\left[\frac{11\pi}{12}, \frac{23\pi}{12}, \frac{\pi}{12}, \frac{13\pi}{12}\right]$

$\frac{50\pi}{12} = \frac{25\pi}{6}$

$(1+2\cos^2 a - 1)(1+2\cos^2 2a - 1) = \frac{1}{8}$

$(2\cos^2 a)(2\cos^2 2a)(2\cos^2 4a) = \frac{1}{8} \quad \cos^2 a \cdot \cos^2 2a \cdot \cos^2 4a = \frac{1}{64}$

$(\cos a)(\cos 2a)(\cos^4 a) = \frac{1}{8} \xrightarrow[\div \sin a]{\times \sin a} \left(\frac{1}{2}\sin 2a \cdot \cos 2a\right)(\cos^4 a) = \frac{1}{8}$

$\frac{1}{2}\sin 4a$

$\frac{1}{4}\sin 4a \cos^4 a = \frac{1}{8} \quad \frac{1}{8}\sin 8a = \frac{1}{8} \quad \sin 8a = 1 \quad 8a = 2k\pi + \frac{\pi}{2}$

$\frac{1}{2}\sin 4a$

$a = \frac{k\pi}{4} + \frac{\pi}{16} \xrightarrow{[0, 3\pi]\text{در بازه}} \left\{\frac{\pi}{16}, \frac{5\pi}{16}, \frac{9\pi}{16}, \frac{13\pi}{16}\right\} \rightarrow$ بیشترین Max $\frac{13\pi}{16}$

(۱۰)

$\tan^3 x = \frac{1}{\tan x} \quad \tan^3 x = \cot x \quad \tan^3 x = -\tan\left(\frac{\pi}{2} + x\right)$

$\tan^3 x = \tan\left(-\frac{\pi}{2} - x\right) \quad 3x = -\frac{\pi}{2} - x + k\pi \quad 4x = k\pi - \frac{\pi}{2} \mid x = \frac{k\pi}{4} - \frac{\pi}{8}$

$\rightarrow$ در بازه $[\pi, 2\pi] \leftarrow \left\{\frac{13\pi}{8}, \frac{11\pi}{8}, \frac{9\pi}{8}, \frac{7\pi}{8}\right\} \leftarrow$ بیشترین $x = \frac{15\pi}{8}$