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۱) $4\cos\alpha = \tan^2\alpha + 1 \Rightarrow 4\cos\alpha = \frac{1}{\cos^2\alpha} \Rightarrow 4\cos^3\alpha = 1$

$\Rightarrow \cos\alpha = \frac{1}{2} \Rightarrow \alpha = \frac{\pi}{3}, \frac{5\pi}{3}$

۲) $5\sin^2\alpha + 2\cos^2\alpha - 2 \Rightarrow 5 - 5\cos^2\alpha + 4\cos^3\alpha - 6\cos\alpha + 2 = 0$

$\Rightarrow 4\cos^3\alpha - 5\cos^2\alpha - 6\cos\alpha + 7 = 0$

$(\cos\alpha + 1)(4\cos^2\alpha + 13\cos\alpha + 7) = 0$ جواب $\cos\alpha = -1$

$\alpha = 2k\pi - \pi$

۳) $2\sin\alpha\cos^2\alpha + \sin\alpha = 1 \rightarrow 2\sin\alpha - 4\sin^3\alpha + \sin\alpha = 1$

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

$\alpha = \frac{3\pi}{2}$

$\sin\alpha = \frac{1}{2} \rightarrow \alpha = \frac{\pi}{6}, \frac{5\pi}{6}$

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

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

$\rightarrow 2\alpha = 2k\pi + \frac{\pi}{6} \Rightarrow \alpha = k\pi + \frac{\pi}{12}$

$2\alpha = 2k\pi - \frac{\pi}{6} \Rightarrow \alpha = k\pi + \frac{5\pi}{12}$ $\Big\}$ $\alpha = \frac{5\pi}{12}, \frac{\pi}{12}, \frac{13\pi}{12}$

$\tan 2\alpha = \frac{2\pi}{3} = -\sqrt{3}$

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

$\rightarrow \sin^2\alpha = \frac{1}{3}$ $m\left(-\sqrt{2}\sin\left(\alpha - \frac{\pi}{3}\right)\right) = \frac{\sqrt{6}}{3}m - \sqrt{3} = \sqrt{3}$

$m = \frac{2\sqrt{3}}{\frac{\sqrt{6}}{3}} = 6$

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$\sin(\alpha+\frac{\pi}{6})\cos(\alpha-\frac{\pi}{6})=1 \rightarrow \cos(\frac{\pi}{2}-\alpha)\cos(\alpha-\frac{\pi}{6})$ (۶

$\rightarrow \sin^2(\alpha+\frac{\pi}{6})=1$ $\sin(\alpha+\frac{\pi}{6})=\pm 1 \rightarrow \alpha+\frac{\pi}{6}=k\pi+\frac{\pi}{2}$

$\rightarrow \alpha=k\pi+\frac{\pi}{3}$ جواب

$\sin\alpha+\sqrt{3}\cos\alpha=\sqrt{2} \xrightarrow{\div 2} \sin(\alpha+\frac{\pi}{3})=\frac{\sqrt{2}}{2} \rightarrow \alpha+\frac{\pi}{3}$ (۷

$=2k\pi+\frac{\pi}{4} \rightarrow \alpha=2k\pi-\frac{\pi}{12}$ $\alpha+\frac{\pi}{3}=k\pi+\frac{3\pi}{4}$

$\alpha=2k\pi+\frac{5\pi}{12}$

$\alpha=\frac{5\pi}{12}, -\frac{\pi}{12}, \frac{23\pi}{12} \rightarrow \frac{5\pi}{12}-\frac{\pi}{12}+\frac{23\pi}{12}=\frac{27\pi}{12}$

$4\sin\alpha\sin(\frac{3\pi}{2}-\alpha)=1 \rightarrow 4\sin\alpha(-\cos\alpha)=1 \rightarrow -4\sin\alpha=-1$ (۸

$\sin 2\alpha=-\frac{1}{2} \rightarrow 2\alpha=2k\pi-\frac{\pi}{6} \rightarrow \alpha=k\pi-\frac{\pi}{12}, 2\alpha=2k\pi-\frac{5\pi}{6}$

$\alpha=k\pi-\frac{5\pi}{12} \rightarrow \frac{7\pi}{12}+\frac{11\pi}{12}+\frac{19\pi}{12}+\frac{23\pi}{12}=5\pi$

$(2\cos^2\alpha)(2\cos^2 2\alpha)(2\cos^2 4\alpha)=1$ (۹

$\cos\alpha\cdot\cos 2\alpha\cdot\cos 4\alpha=\pm\frac{1}{8} \rightarrow \frac{\sin 8\alpha}{8}=\pm\frac{1}{8}\sin\alpha$

$\sin 8\alpha=\sin\alpha \rightarrow \alpha=\frac{2k\pi}{7}=\frac{6\pi}{7}$

$\alpha=\frac{2k\pi}{9}+\frac{\pi}{9}=\pi$ $\max=\pi$

$\sin^8\alpha=\sin(-\alpha) \rightarrow \alpha=\frac{2k\pi}{9}=\frac{8\pi}{9}$

$\alpha=\frac{2k\pi}{7}+\frac{\pi}{7}=\pi$

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$\tan 3\alpha \tan\alpha = 1 \rightarrow \tan 3\alpha = \frac{1}{\tan\alpha} = \tan 3\alpha = \tan\left(\frac{\pi}{2} - \alpha\right)$ (10

$\rightarrow 3\alpha = k\pi + \frac{\pi}{2} - \alpha$

$4\alpha = k\pi + \frac{\pi}{2} \rightarrow \alpha = \frac{k\pi}{4} + \frac{\pi}{8} \rightarrow \frac{9\pi}{8} + \frac{11\pi}{8} + \frac{13\pi}{8} +$

$\frac{13\pi}{8} = 9\pi$