۱

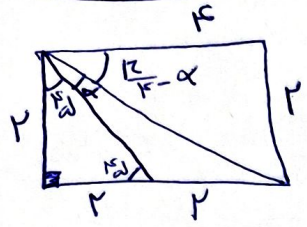
$\alpha\beta$ $\frac{1}{2}\sin\alpha = 4.5$

$3\sqrt{3}\sin\alpha = 4.5$

$\sin\alpha = \frac{\sqrt{3}}{2}$

$\frac{120}{60} = 2$

۲



$\tan\left(\frac{\pi}{4}-\alpha\right) = \cot\alpha$

$\frac{4}{2} = 2$

۳

$\frac{\cos\alpha}{\sin\alpha} = \frac{3}{\pi}$

$\frac{\cos^2\alpha}{\sin^2\alpha} = \frac{\pi}{2}$

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

$2(\cos^2\alpha - \sin^2\alpha) = 2\cos\alpha\sin\alpha\,\pi$

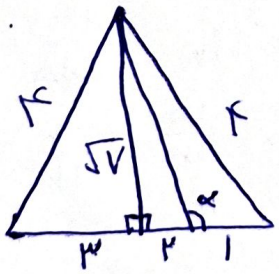
$3\sin\alpha = \cos\alpha\,\pi$

$3\sin^2\alpha = \cos^2\alpha - \sin^2\alpha$

زاویه کمتر از ۹۰ درجه $\begin{cases} 4\sin^2\alpha = \cos^2\alpha \\ 2\sin\alpha = \cos\alpha \end{cases}$

$\cot\alpha = \frac{2\sin\alpha}{\sin\alpha} = 2$

۴



$3^2 + x^2 = 4^2$

$x^2 = 7$

$x = \sqrt{7}$

$\tan(\pi-\alpha) = -\tan\alpha$

$\tan(\pi-\alpha) = \frac{\sqrt{7}}{2}$

$\tan\alpha = \frac{-\sqrt{7}}{2}$

۵

$\underbrace{\sin^2\alpha + \cos^2\alpha}_{1} + \sin^2\alpha = \frac{4}{3}$

$\sin^2\alpha = \frac{1}{3}$

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

$\tan^2\alpha = \frac{\frac{1}{3}}{\frac{2}{3}} = \frac{1}{2}$

$\sin^4\alpha = (1-\cos^2\alpha)^2 = 1+\cos^4\alpha - 2\cos^2\alpha$

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

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

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

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

۶

$\sin\left(\frac{9\pi}{2}+\alpha\right) = -\cos\alpha$

$\cos\left(\frac{7\pi}{2}-\alpha\right) = -\sin\alpha$

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

$\sin\alpha\cos\alpha + \cot\alpha$

$1+\frac{16}{9} = \frac{1}{\cos^2\alpha}$ $\quad \frac{25}{9} = \frac{1}{\cos^2\alpha}$ $\quad \cos\alpha = \frac{-3}{5}$ $\quad \sin\alpha = \frac{-4}{5}$

$\frac{-4}{5}\times\frac{-3}{5} + \frac{3}{4} = \frac{12}{25} + \frac{3}{4} = \frac{48+75}{100}$

$\frac{123}{100}$

۷

$3\cos\frac{\pi}{3} + \sqrt{2}\left(\sin\frac{\pi}{12} - \cos\frac{\pi}{12}\right)$

$3\cos 60 + \sqrt{2}(\sin 15 - \cos 15)$

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

$\cos^2 15 = \frac{1+\frac{\sqrt{3}}{2}}{2} = \frac{2+\sqrt{3}}{4}$ $\quad \cos 15 = \frac{\sqrt{2+\sqrt{3}}}{2}$

$\sin^2 15 = \frac{1-\frac{\sqrt{3}}{2}}{2} = \frac{2-\sqrt{3}}{4}$ $\quad \sin 15 = \frac{\sqrt{2-\sqrt{3}}}{2}$

$\sqrt{2}\times\frac{\sqrt{2-\sqrt{3}}}{2} - \frac{\sqrt{2+\sqrt{3}}}{2} = \frac{\sqrt{4-2\sqrt{3}} - \sqrt{4+2\sqrt{3}}}{2}$

$\frac{3}{2} - 1 = \boxed{\frac{1}{2}}$

۸

$\tan(\alpha) = \frac{\frac{1}{2}}{1-\frac{1}{16}} = \frac{\frac{1}{2}}{\frac{15}{16}} = \frac{8}{15}$

$\sin\alpha = \frac{2\tan}{1+\tan^2} = \frac{\frac{1}{2}}{\frac{17}{16}} = \frac{8}{17}$

$\cos\alpha = \frac{1-\tan^2}{1+\tan^2} = \frac{1-\frac{1}{16}}{1+\frac{1}{16}} = \frac{\frac{15}{16}}{\frac{17}{16}} = \frac{15}{17}$

$\tan\alpha - \sin\alpha = \frac{8}{15} - \frac{8}{17} = \frac{16}{255}$

$\sin\alpha - \cos\alpha = \frac{8}{17} - \frac{15}{17} = \frac{-7}{17}$

$\frac{\frac{16}{255}}{\frac{-7}{17}} = \boxed{\frac{-16}{105}}$

۹

$2\sin\alpha < 2\sin\alpha\cos\alpha$

$0 < 2\sin\alpha\cos\alpha - 2\sin\alpha$

$0 < 2\sin\alpha(\cos\alpha - 1)$

✗	✗
✓	✓

$\frac{\cos\alpha}{\sin\alpha} = \frac{\cos\alpha}{\sin^2\alpha} > 0$

✗	✗
✗	✓

۱۰

تا حیف ۴