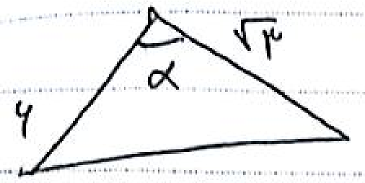
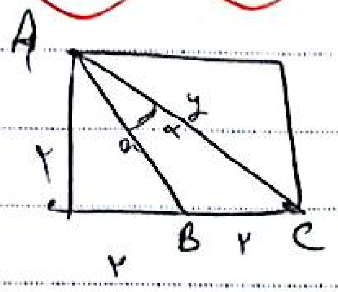
(1)



$S = \frac{1}{2} \times 4 \times \sqrt{3} \times \sin\alpha = 4.5$

$\sin\alpha = \frac{\sqrt{3}}{2} \rightarrow \alpha = 60$ یا $120 \rightarrow \frac{120}{60} = 2$

(2)



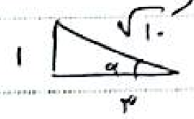
$x = 2\sqrt{2}$
$y = 2\sqrt{5}$ } فیثاغورس

$A\hat{B}C$: $BC = \sqrt{x^2 + y^2 - 2xy\cos\alpha}$

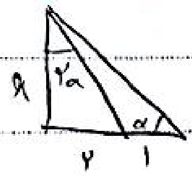
$4 = 8 + 20 - \sqrt{10}\cos\alpha$

$\cos\alpha = \frac{3}{\sqrt{10}}$

$\cot\alpha = 3$



(3)



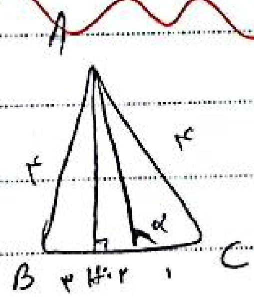
$\cot\alpha = \frac{3}{x} \rightarrow \tan x = \frac{x}{3}$ $\quad \tan 2\alpha = \frac{2\tan\alpha}{1-\tan^2\alpha}$

$\tan 2\alpha = \frac{2}{x}$

$\frac{2}{x} = \frac{\frac{2x}{3}}{1-\frac{x^2}{9}} \rightarrow 2 - \frac{2x^2}{9} = \frac{2x^2}{3}$ $\quad \frac{4x^2}{9} = 1 \rightarrow x = \pm\frac{3}{2}$

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

(4)



$AH = \sqrt{16-9} = \sqrt{7}$

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

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

(5)

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

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

Arman

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

6

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

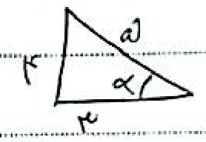
$$\sin^4\alpha = (\sin^2\alpha)^2 = (1-\cos^2\alpha)^2 = 1+\cos^4\alpha - 2\cos^2\alpha$$

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

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

7

$$\sin\left(\frac{9\pi}{2}+\alpha\right)\cos\left(\frac{7\pi}{2}-\alpha\right) - \tan\left(\alpha - \frac{3\pi}{2}\right) =$$



$\sin\alpha = -\frac{4}{5}$

$\cos\alpha = -\frac{3}{5}$

$\cot = \frac{3}{4}$

$$\cos\alpha \cdot (-\sin\alpha) + \cot\alpha = \left(-\frac{3}{5} \cdot \frac{4}{5}\right) + \frac{3}{4} = \boxed{\frac{27}{100}}$$

($-\frac{12}{25}$)

8

$$\sin^2\frac{\pi}{12} = \frac{1-\cos\frac{\pi}{6}}{2} = \frac{1-\frac{\sqrt{3}}{2}}{2} \rightarrow \sin\frac{\pi}{12} = \frac{\sqrt{2-\sqrt{3}}}{2}$$

$$\cos^2\frac{\pi}{12} = \frac{1+\cos\frac{\pi}{6}}{2} = \frac{1+\frac{\sqrt{3}}{2}}{2} \rightarrow \cos\frac{\pi}{12} = \frac{\sqrt{2+\sqrt{3}}}{2}$$

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

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

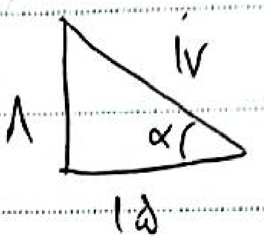
Arman

۹

$\tan^2(\frac{\alpha}{2}) = \frac{1-\cos\alpha}{1+\cos\alpha} \rightarrow \frac{1}{16} = \frac{1-\cos\alpha}{1+\cos\alpha}$

$17\cos\alpha = 15$

$\cos\alpha = \frac{15}{17}$



$\sin\alpha = \frac{8}{17}$

$\tan\alpha = \frac{8}{15}$

$\frac{\tan\alpha - \sin\alpha}{\sin\alpha - \cos\alpha} = \frac{\frac{8}{15} - \frac{8}{17}}{\frac{8}{17} - \frac{15}{17}} = \frac{\frac{16}{255}}{\frac{-7}{17}} = \boxed{-\frac{16}{105}}$

۱۰

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

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

$\cos\alpha > 1 \rightarrow$ غ ق ق

$\cos\alpha < 1$ ✓ → پس $2\sin\alpha < 0$

$\sin\alpha < 0$, $\frac{\cot\alpha}{\sin\alpha} > 0 \rightarrow \cot\alpha < 0 \rightarrow$ ناحیه چهارم