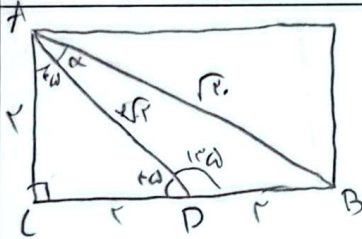


$$S_{\triangle ABC} \sin \alpha \Rightarrow F \cdot D = \frac{1}{2} \times \sqrt{3} \times 4 \times \sin \alpha \rightarrow \sin \alpha = \frac{9}{\sqrt{3} \times 4} = \frac{\sqrt{3}}{4}$$

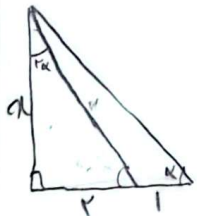
$$\Rightarrow \alpha_1 = 90^\circ \quad \alpha_2 = 120^\circ \quad \frac{\alpha_2}{\alpha_1} = \frac{120}{90} = \frac{4}{3}$$



$$S_{\triangle ABD} = \frac{1}{2} \times 4 \times 4 = 8$$

$$S_{\triangle ABD} = \frac{1}{2} \times \sqrt{3} \times 4 \times \sin \alpha = 8 \rightarrow \sin \alpha = \frac{\sqrt{3}}{4}$$

$$\rightarrow \cos \alpha = \frac{\sqrt{7}}{4} \Rightarrow \cot \alpha = \frac{\cos \alpha}{\sin \alpha} = \frac{\frac{\sqrt{7}}{4}}{\frac{\sqrt{3}}{4}} = \sqrt{7} = 3$$



$$\tan \alpha = \frac{4}{1}$$

$$\cot \alpha = \frac{1}{4}$$

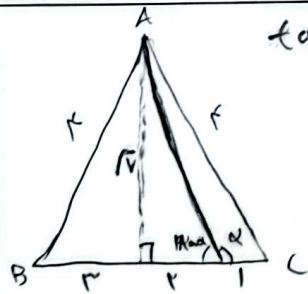
$$\cot \alpha = \frac{1 - \tan^2 \alpha}{2 \tan \alpha}$$

$$\frac{4}{1} = \frac{1 - \frac{16}{1}}{\frac{2 \times 4}{1}} \rightarrow \frac{4}{1} = \frac{1 - 16}{8} \rightarrow \frac{4}{1} = \frac{-15}{8}$$

$$\rightarrow 32 = 9 - 16$$

$$\rightarrow \tan^2 \alpha = 9 \rightarrow \alpha = \frac{3\pi}{4} \rightarrow \cot \alpha = \frac{1}{\tan \alpha} = \frac{1}{3} = 3$$

$$\cot \alpha = \frac{1}{3} = 3$$



$$\tan(180^\circ - \alpha) = -\tan \alpha = \frac{\sqrt{3}}{4}$$

$$\rightarrow \tan \alpha = -\frac{\sqrt{3}}{4}$$

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

$$1 + \cot^2 \alpha = \frac{1}{\sin^2 \alpha} \rightarrow 1 + \cot^2 \alpha = r \rightarrow \cot^2 \alpha = r - 1 \rightarrow \tan^2 \alpha = \frac{1}{r-1}$$

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

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

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

6

$$1 + \tan^2 \alpha = \frac{1}{\cos^2 \alpha} \rightarrow \frac{r^2}{9} = \frac{1}{\cos^2 \alpha} \rightarrow -\cos \alpha = \frac{r}{3}, -\sin \alpha = \frac{r}{3}, \cot \alpha = \frac{r}{r}$$

$$\rightarrow \sin\left(\frac{9r}{r} + \alpha\right) \cdot \cos\left(\frac{\sqrt{r}}{r} - \alpha\right) - \tan\left(\alpha - \frac{\sqrt{r}}{r}\right) = \cos \alpha \cdot (-\sin \alpha) + \cot \alpha$$

$$\left(-\frac{r}{3}\right) \times \left(+\frac{r}{3}\right) + \frac{r}{r} = \frac{-r^2}{9} + \frac{r}{r} = \frac{-r^2 + r^2}{100} = \frac{r^2}{100}$$

7

$$r \cos \frac{\pi}{r} + (\sqrt{r} \sin \frac{\pi}{r} - \sqrt{r} \cos \frac{\pi}{r}) = r \cos \frac{\pi}{r} + r \sin\left(-\frac{\pi}{r}\right) = r \times \frac{1}{r} - r \times \frac{1}{r}$$

$$= \frac{1}{r}$$

$$\sin \alpha - \cos \alpha = \sqrt{r} \sin\left(\alpha - \frac{\pi}{r}\right)$$

$$\frac{\pi}{r} - \frac{\pi}{r} = \frac{\pi - r\pi}{r} = -\frac{r\pi}{r} = -\frac{\pi}{r}$$

8

$$\tan \alpha = \frac{r \tan \frac{\alpha}{r}}{1 - \tan^2 \frac{\alpha}{r}} \rightarrow \tan \alpha = \frac{\frac{1}{r}}{\frac{10}{14}} = \frac{1}{10} \rightarrow \sin \alpha = \frac{1}{14}, \cos \alpha = \frac{14}{14}$$

$$\frac{\tan \alpha - \sin \alpha}{\sin \alpha - \cos \alpha} = \frac{\frac{1}{10} - \frac{1}{14}}{\frac{1}{14} - \frac{14}{14}} = \frac{\frac{14}{140} - \frac{10}{140}}{\frac{1}{14} - \frac{14}{14}} = \frac{\frac{4}{140}}{\frac{-13}{14}} = \frac{4}{100}$$

9

$\frac{\cot \alpha}{\sin \alpha} > 0 \rightarrow$  ربع اول یا ربع چهارم  
 ↓  
 مثبت منفی      مثبت مثبت

ربع چهارم

$$r \sin \alpha < \sin^2 \alpha \rightarrow r \sin \alpha < r \sin \alpha \cos \alpha$$

ربع سوم یا ربع چهارم  
 ← -r cos α

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