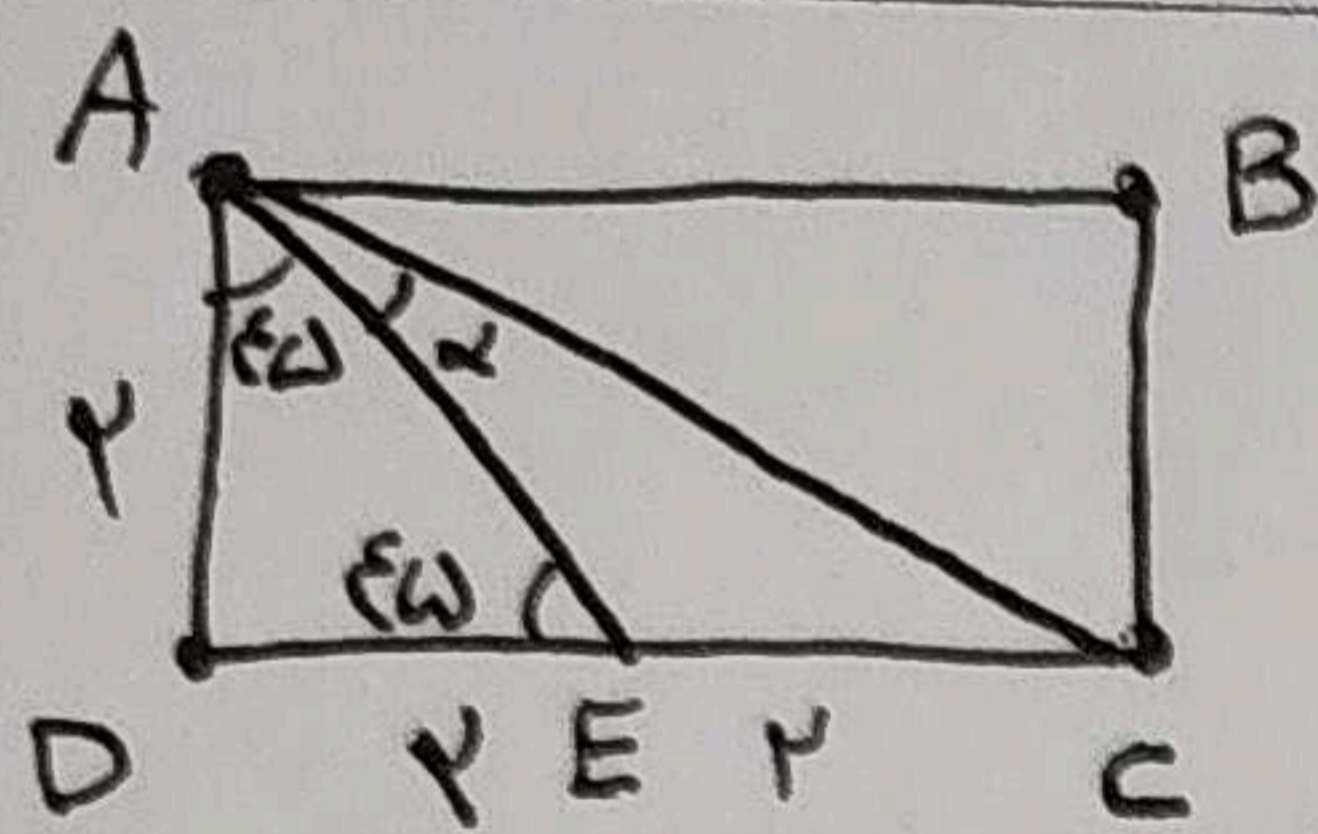


$$0 < \alpha < 180 \rightarrow \frac{\max}{\min} = \frac{120}{60} = 2$$

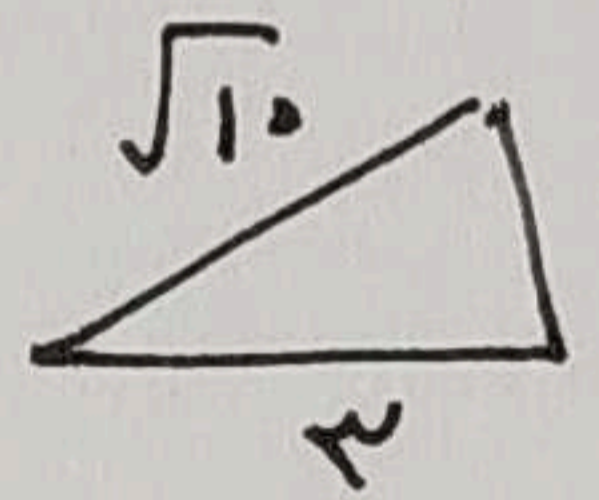
$$S = \frac{1}{2} \times 9 \times \sqrt{3} \times \sin \alpha = 3\sqrt{3} \sin \alpha = 9 \Rightarrow \sin \alpha = \frac{9}{3\sqrt{3}} = \frac{\sqrt{3}}{2}$$



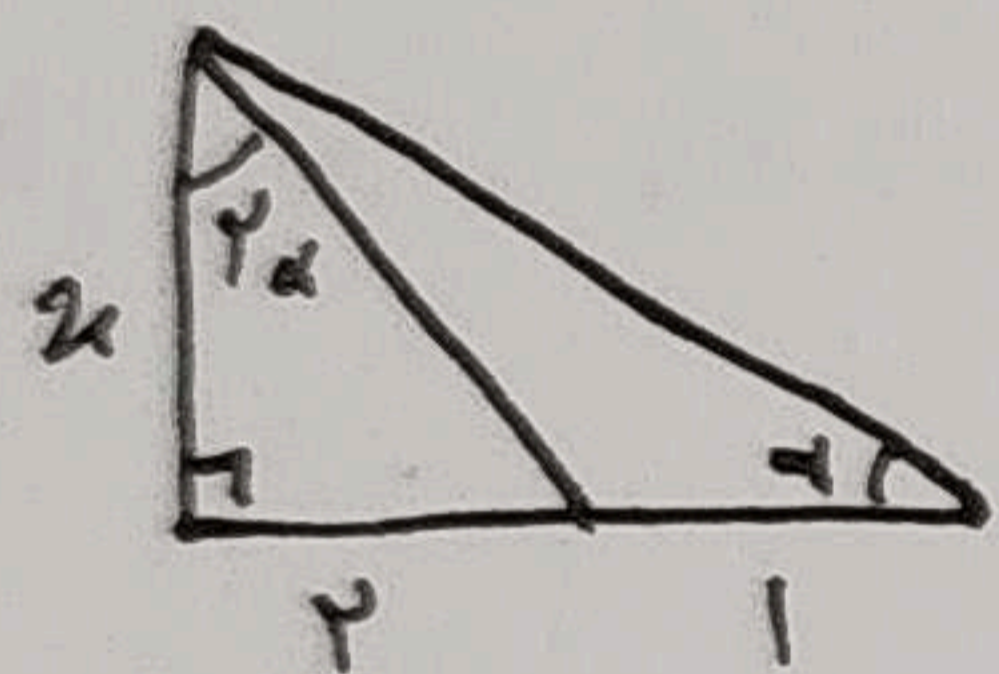
$$AE = \sqrt{2^2 + 2^2} = 2\sqrt{2} \quad AC = \sqrt{2^2 + 4^2} = 2\sqrt{5}$$

$$EC = \sqrt{a^2 + b^2 - 2ab \cos \alpha} = \sqrt{21 - 11\sqrt{10} \cos \alpha} = \sqrt{5}$$

$$\Rightarrow 21 - 11\sqrt{10} \cos \alpha = 5 \rightarrow \cos \alpha = \frac{8}{\sqrt{10}}$$



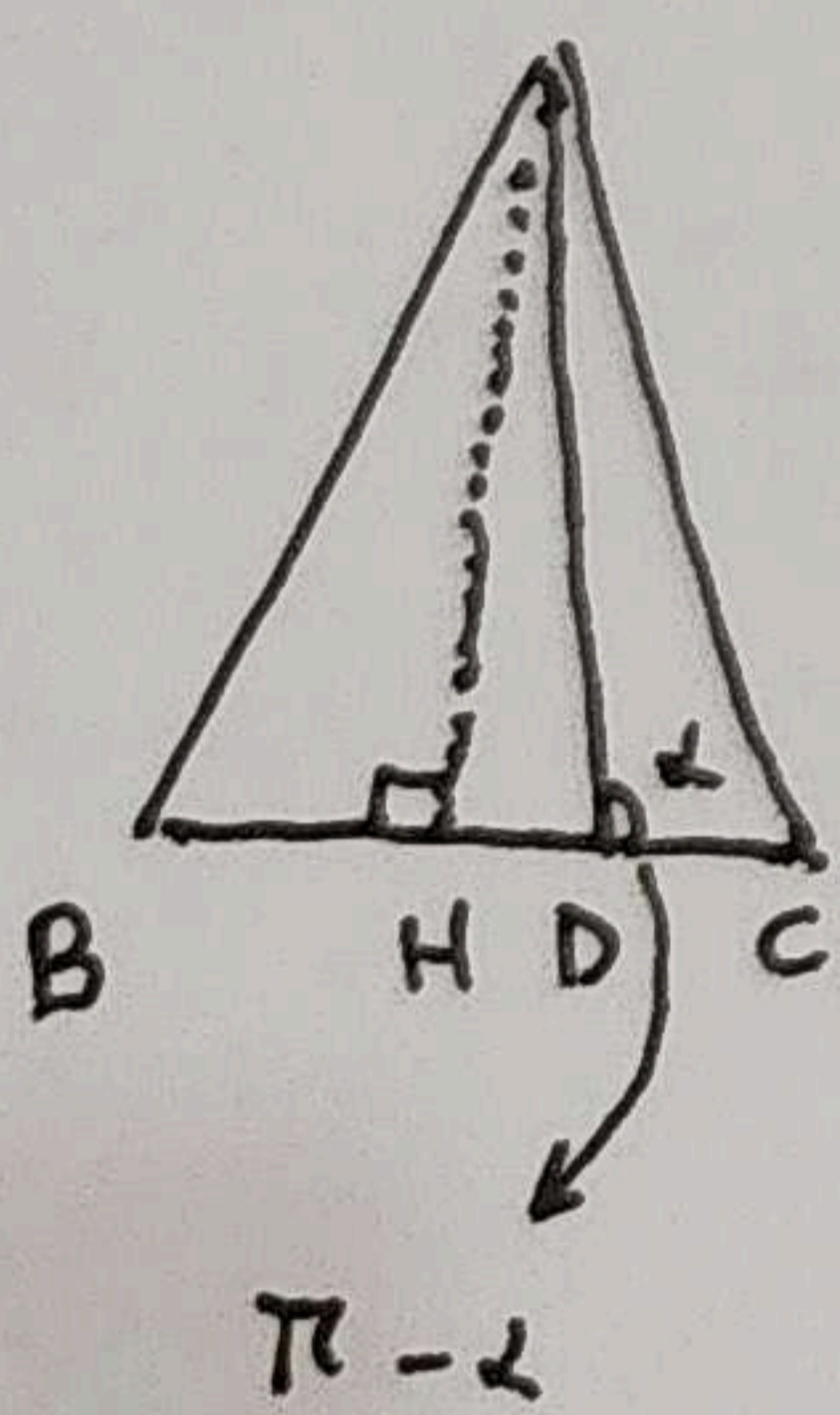
$$\cot = \frac{3}{1} = 3$$



$$\tan \alpha = \frac{2}{1} \quad \cot \alpha = \frac{1}{2}$$

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

$$1 - \frac{2^2}{1} = \frac{2^2}{1} \Rightarrow \frac{8}{1} = 1 \Rightarrow 2 = \frac{1}{2} \Rightarrow \cot \alpha = \frac{1}{2} = 2$$



$$AH = \sqrt{14 - 9} = \sqrt{5}$$

$$\tan(\pi - \alpha) = \frac{AH}{HD} = \frac{\sqrt{5}}{1}$$

$$\tan \alpha = -\tan(\pi - \alpha) = \frac{-\sqrt{5}}{1}$$

~~.....~~

$$\sin^2 \alpha + \sin^2 \alpha + \cos^2 \alpha = \frac{5}{2} \Rightarrow \frac{5}{2} - \frac{1}{2} = \sin^2 \alpha$$

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

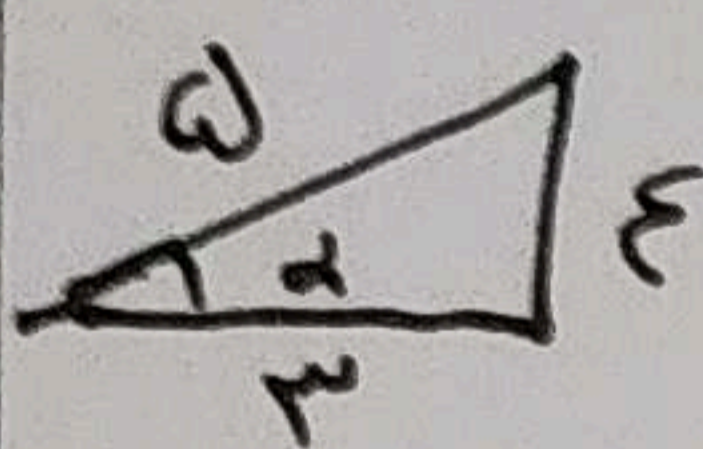
$$\tan^2 \alpha = \frac{\sin^2 \alpha}{\cos^2 \alpha} = \frac{1/2}{1/2} = 1$$

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

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

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

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



$$\sin \alpha = \frac{a}{r}$$

$$\cot \alpha = \frac{b}{a}$$

$$\cos \alpha = \frac{b}{r}$$

$$\sin \left(\frac{9\pi}{4} + \alpha \right) = \cos \alpha = \frac{b}{r}$$

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

$$\sin \left(\frac{9\pi}{4} + \alpha \right) \cos \left(\frac{5\pi}{4} - \alpha \right) - \tan \left(\alpha - \frac{\pi}{4} \right)$$

$$\cos \left(\frac{5\pi}{4} - \alpha \right) = -\sin \alpha = \frac{a}{r} \Rightarrow \left(\frac{b}{r} \times \frac{a}{r} - \left(-\frac{b}{a} \right) \right) = \frac{r}{10}$$

$$r \cos \alpha = r \cos \frac{\pi}{4} = r \times \frac{1}{\sqrt{2}} = \frac{r}{\sqrt{2}}$$

$$\sqrt{r} \sin \alpha - \sqrt{r} \cos \alpha = \sqrt{r} (\sin \alpha - \cos \alpha) \xrightarrow{\text{تربيع}} r (\sin^2 \alpha + \cos^2 \alpha - 2 \sin \alpha \cos \alpha)$$

$$\Rightarrow = r (1 - \sin 2\alpha)$$

$$= r - r \sin \frac{\pi}{4} = 1 \Rightarrow \sqrt{r} \sin \alpha - \sqrt{r} \cos \alpha \xrightarrow{\begin{matrix} -1 \\ \sqrt{2} \end{matrix}}$$

$$\frac{r}{\sqrt{2}} + (-1) = \frac{1}{\sqrt{2}}$$

$$\frac{\sin \frac{\alpha}{r}}{\cos \frac{\alpha}{r}} = \frac{1}{r} \Rightarrow \cos \frac{\alpha}{r} = r \sin \frac{\alpha}{r}$$

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

$$\Rightarrow \sin^r \frac{\alpha}{r} + 1^r \sin^r \frac{\alpha}{r} = 1 \Rightarrow \sin \frac{\alpha}{r} = \frac{1}{\sqrt{1+r}}$$

$$\cos \alpha = \cos^r \frac{\alpha}{r} - \sin^r \frac{\alpha}{r} = \frac{10}{10}$$

$$\sin \alpha = r \sin^r \frac{\alpha}{r} \cos \frac{\alpha}{r} = r \times \frac{1}{\sqrt{1+r}} \times \frac{r}{\sqrt{1+r}} = \frac{r}{\sqrt{1+r}} \Rightarrow \frac{\frac{1}{10} - \frac{1}{10}}{\frac{1}{10}} = \frac{-19}{100} \cos \frac{\alpha}{r} = \frac{r}{\sqrt{1+r}}$$

$$\sin^r \alpha = r \sin \alpha \cos \alpha \Rightarrow r \sin \alpha < r \sin \alpha \cos \alpha$$

$$\Rightarrow r \sin \alpha \cos \alpha - r \sin \alpha > 0 \quad r \sin \alpha (\cos \alpha - 1) > 0 \Rightarrow \sin \alpha < 0$$

$$\left. \begin{matrix} \cot \alpha < 0 \\ \frac{\cot \alpha}{\sin \alpha} > 0 \end{matrix} \right\} \text{ناب، ناقص}$$