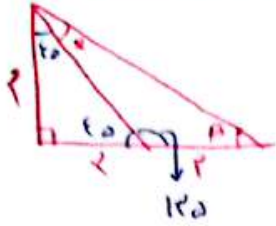


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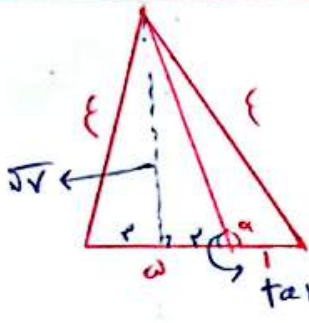
$$\sqrt{r} \sin \alpha = \frac{r}{\sqrt{r}} \times \sqrt{r} \times \sin \alpha \Rightarrow \sin \alpha = \frac{\sqrt{r}}{r} \left\{ \begin{array}{l} \alpha = 45^\circ \\ \alpha = 135^\circ \end{array} \right. \rightarrow \frac{1\sqrt{r}}{r} = \frac{1}{\sqrt{r}} \quad (2) - 1$$



$\cot \beta = r, \tan \beta = \tan(\frac{\pi}{2} - \alpha) = \frac{1}{r} = \frac{\tan \frac{\pi}{2} - \tan \alpha}{1 + \tan \frac{\pi}{2} \tan \alpha}$
 $\Rightarrow \beta = \pi - \alpha - \frac{\pi}{2} = \frac{\pi}{2} - \alpha$

$\frac{1}{r} = \frac{\tan \frac{\pi}{2} - \tan \alpha}{1 + \tan \frac{\pi}{2} \tan \alpha} \Rightarrow \tan \alpha + 1 = r \tan \alpha - r$
 $\tan \alpha = r \rightarrow \cot \alpha = \frac{1}{r}$

$\cot \alpha = \frac{r}{x} \Rightarrow \tan \alpha = \frac{x}{r}$
 $\cot \alpha = \frac{x}{r} \Rightarrow \tan \alpha = \frac{r \tan \alpha}{1 - \tan^2 \alpha} \Rightarrow \frac{r}{x} = \frac{r \tan \alpha}{1 - \tan^2 \alpha} \Rightarrow 4x^2 = 11 - 2x^2$
 $\Rightarrow x^2 = \frac{11}{6} \rightarrow x = \pm \frac{\sqrt{11}}{\sqrt{6}}$
 $\cot \alpha = r \checkmark \leftarrow x = \frac{r}{r}$



$\frac{\sqrt{r}}{r} = \tan \alpha \Rightarrow \tan \alpha = \frac{\sqrt{r}}{r} \checkmark$

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

$\sin^2 \alpha = \frac{1}{r} \Rightarrow \cos^2 \alpha = \frac{r-1}{r} \Rightarrow \tan^2 \alpha = \frac{1}{r} \checkmark$

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

$\sin(\frac{\pi}{2} + \alpha) \cos(\frac{\pi}{2} - \alpha) + \tan(\frac{\pi}{2} - \alpha) = \cos \alpha \times \sin \alpha + \cot \alpha$

$\frac{1}{2} \times \frac{1}{2} + \frac{1}{1} = \frac{r}{r} - \frac{1}{r} = \frac{r-1}{r} = \frac{r-1}{r}$

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

$\tan \alpha = \frac{r \times \frac{1}{r}}{1 - \frac{1}{r}} = \frac{1}{1 - \frac{1}{r}} = \frac{r}{r-1} \Rightarrow \frac{r}{r-1} = \frac{1}{\sin \alpha} \Rightarrow \sin \alpha = \frac{r-1}{r}$

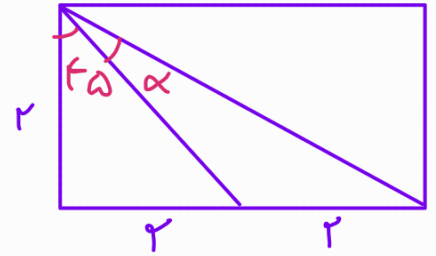
$\frac{1}{r} = \frac{1}{\sin \alpha} \Rightarrow \sin \alpha = \frac{1}{r}$
 $\frac{1}{r} = \frac{1}{\sin \alpha} \Rightarrow \frac{1}{r} = \frac{1}{\frac{1}{r}} = r \Rightarrow \frac{1}{r} = r \Rightarrow r^2 = 1 \Rightarrow r = \pm 1$

$\cos > 0 \checkmark \rightarrow (1) \text{ و } (3)$

$r \sin < r \sin \times \cos \xrightarrow{\alpha < \cos} \sin > \alpha \rightarrow \sin > \alpha$

$$\tan\left(\alpha + \frac{\pi}{4}\right) = \frac{\tan\alpha + 1}{1 - \tan\alpha} = r \rightarrow \tan\alpha + 1 = r - r\tan\alpha \quad -r$$

$$r\tan\alpha = 1 \rightarrow \tan\alpha = \frac{1}{r} \rightarrow \cot\alpha = r$$



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

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

\downarrow

$$\sin\alpha < 0$$

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