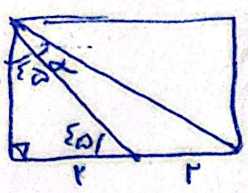


(۱)

$$\frac{\Sigma}{\rho} = \frac{1}{\rho} \times \rho \times \sqrt{\Sigma^2} \times \sin \alpha \Rightarrow \sin \alpha = \frac{\sqrt{\Sigma^2}}{\rho} \begin{cases} \alpha = 12^\circ \\ \alpha = 4^\circ \end{cases} \quad \frac{12^\circ}{9^\circ} = (2)$$

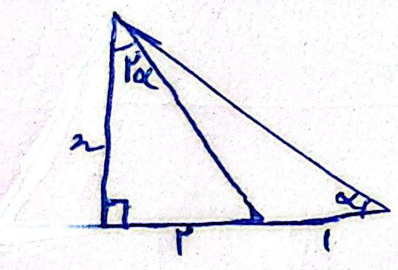
(۲)



$$\cot(\alpha + \varepsilon \rho) = \frac{\cot \alpha \cot \varepsilon \rho - 1}{\cot \varepsilon \rho + \cot \alpha} = \frac{\rho}{\Sigma} = \frac{1}{\rho}$$

$$\Rightarrow \frac{\cot \alpha - 1}{1 + \cot \alpha} = \frac{1}{\rho} \Rightarrow \rho \cot \alpha - \rho = 1 + \cot \alpha \Rightarrow \boxed{\cot \alpha = \rho}$$

(۳)



$$\cot \alpha = \frac{\rho}{n} = ?$$

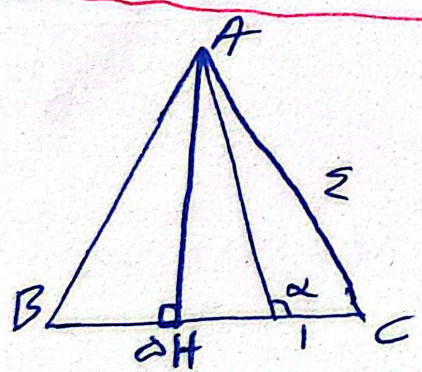
$$\tan \alpha = \frac{n}{\rho} \quad \tan \rho \alpha = \frac{\rho}{n} \frac{\rho}{\rho} = \frac{\rho}{n}$$

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

$$\Rightarrow \frac{\rho n}{\rho^2 - n^2} = \frac{\rho}{n} \Rightarrow \rho n^2 = \rho^2 - n^2 \rho \Rightarrow \rho n^2 = \rho^2$$

$$\Rightarrow n = \pm \frac{\rho}{\rho} \begin{cases} n = \frac{\rho}{\rho} \sqrt{\rho^2} \\ n = \frac{\rho}{\rho} \sqrt{\rho^2} \end{cases} \quad \tan \alpha = \frac{\rho}{\rho} = \frac{1}{\rho} \Rightarrow \boxed{\cot \alpha = \rho}$$

(۴)



$$\Delta AHC \Rightarrow AH^2 + \rho^2 = 17^2 \rightarrow AH = \sqrt{17}$$

$$\Delta AHC \Rightarrow \tan(180^\circ - \alpha) = \frac{\sqrt{17}}{\rho}$$

$$\tan(180^\circ - \alpha) = -\tan \alpha \Rightarrow \tan \alpha = \frac{\sqrt{17}}{\rho}$$

(۵)

$$\rho \sin^2 \alpha + \cos^2 \alpha = \frac{\Sigma}{\rho} \Rightarrow \sin^2 \alpha + 1 = \frac{\Sigma}{\rho} \Rightarrow \sin^2 \alpha = \frac{1}{\rho} \Rightarrow \sin \alpha = \pm \frac{1}{\sqrt{\rho}}$$

$$\cos \alpha = \pm \frac{\sqrt{\rho}}{\sqrt{\rho}} \quad \boxed{\tan^2 \alpha = \frac{1}{\rho}}$$

(۶)

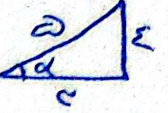
$$\frac{\sin^2 \alpha + \varepsilon \cos^2 \alpha}{1 + \cos^2 \alpha} - \frac{\cos^2 \alpha + \varepsilon \sin^2 \alpha}{1 + \sin^2 \alpha} = \frac{\sin^2 \alpha + \varepsilon(1 - \sin^2 \alpha)}{1 + (1 - \sin^2 \alpha)} - \frac{\cos^2 \alpha + \varepsilon(1 - \cos^2 \alpha)}{1 + (1 - \cos^2 \alpha)}$$

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

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

$$\sin\left(\frac{a\pi}{r} + \alpha\right) \cos\left(\frac{v\pi}{r} - \alpha\right) - \tan\left(\alpha - \frac{c\pi}{r}\right) = \cos\alpha x - \sin\alpha + \cot\alpha$$

$$\Rightarrow \left(\frac{-c}{a} \times \frac{e}{a}\right) + \frac{c}{e} = \frac{-\epsilon r + v d}{100} = \left(\frac{rv}{100}\right)$$

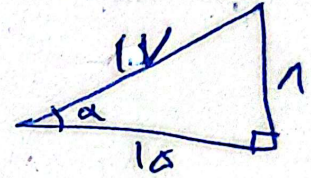


$$c \cos \epsilon r + \sqrt{r} \sin \epsilon r - \sqrt{r} \cos \epsilon r = r \cos\left(\frac{\pi}{e}\right) + \sqrt{r} (\sin \epsilon r - \cos \epsilon r)$$

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

$$= \frac{r}{r} + r \sin\left(\frac{-\pi}{e}\right) = \frac{c}{r} - 1 = \left(\frac{1}{r}\right)$$

$$\tan \alpha = \frac{r \tan\left(\frac{\alpha}{r}\right)}{1 - \tan^2\left(\frac{\alpha}{r}\right)} = \frac{r \times \frac{1}{e}}{1 - \frac{1}{16}} = \frac{\frac{1}{r}}{\frac{15}{16}} = \frac{1}{15}$$



$$\frac{\tan \alpha - \sin \alpha}{\sin \alpha - \cos \alpha} = \frac{\frac{1}{15} - \frac{1}{16}}{\frac{1}{16} - \frac{1}{15}} = \left(\frac{-16}{108}\right)$$

$$\frac{\cot \alpha}{\sin \alpha} > 0 \rightarrow \frac{\cos \alpha}{\sin^2 \alpha} > 0 \rightarrow \left(\cos \alpha > 0\right) \text{ ①}$$

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

$$\sin \alpha > 0 \rightarrow \cos \alpha > 1 \Rightarrow \text{QOE}$$

$$\text{①, ②} \Rightarrow \left(\frac{r}{e} = 0\right)$$

$$\left(\sin \alpha < 0\right) \rightarrow \cos \alpha < 1 \text{ QOE}$$

③