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①

الف) $(\sin 135^\circ + \sin 45^\circ) (\cos 135^\circ - \cos 45^\circ)$

$$\left(\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2} \right) \left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} \right) \rightarrow \frac{2}{2} - \frac{2}{2} = -\frac{1}{2}$$

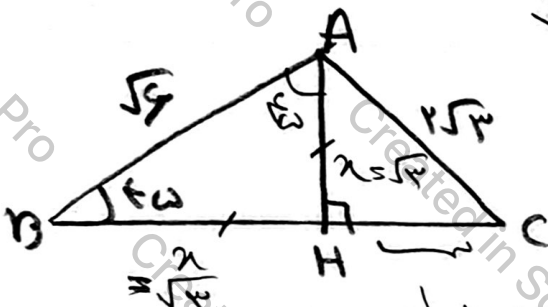
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$$\rightarrow \frac{1 + 2 \tan^2 45^\circ}{2 \cos^2 45^\circ + 2 \cos^2 45^\circ} = \frac{1 + 2 \left(\frac{\sqrt{2}}{2} \right)^2}{\left(2 \times \left(\frac{\sqrt{2}}{2} \right)^2 \right) + \left(2 \times \left(-\frac{\sqrt{2}}{2} \right)^2 \right)} = \frac{1+1}{2+1} = \frac{2}{3} = \frac{1}{1.5}$$

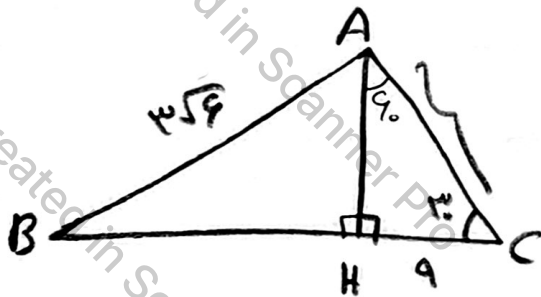
②

$$\sqrt{4} = \sqrt{2} \times 2 \rightarrow 2 = \sqrt{2}$$

$$AH = \frac{\sqrt{2}}{2} \times \sqrt{4} = \frac{\sqrt{2}}{2} \times 2 = \sqrt{2}$$



$$\rightarrow HC = \sqrt{11 - 2} = \sqrt{9} = 3$$



$$\frac{\sqrt{2}}{2} \times AC = 9 \rightarrow AC = 9 \times \frac{2}{\sqrt{2}} = 6\sqrt{2}$$

$$\frac{BC}{\sin A} = \frac{AC}{\sin B} = \frac{AB}{\sin C}$$

$$\frac{6\sqrt{2}}{\sin B} = \frac{3\sqrt{2}}{\sin 45^\circ} \rightarrow \sin B = \frac{1 \times \sqrt{2} \times 2}{2} = 1$$

③

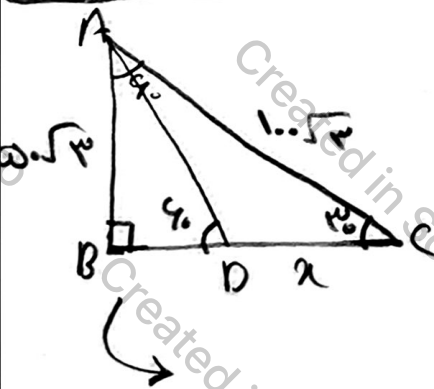
$$AB \times \frac{1}{2} = 10 \cdot \sqrt{3}$$

$$D = 12, C = 3$$

$$AB = 10\sqrt{3}$$

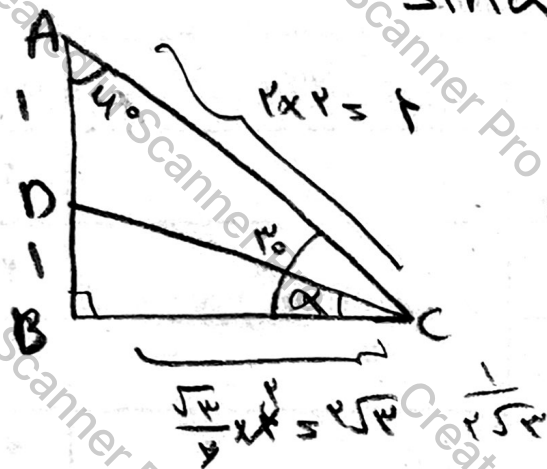
$$\rightarrow A = 30^\circ \rightarrow DC = AD = 10$$

$$AD = \frac{10\sqrt{3}}{\sqrt{3}} = \frac{10\sqrt{3}}{\sqrt{3}} = 10$$



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ج)



$$\sin \alpha = \frac{1}{\sqrt{13}}$$

$$DC^2 = (r\sqrt{3})^2 + (r/4)^2 = 13 \rightarrow DC = \sqrt{13}$$

$$\frac{AB}{\sin 10^\circ} = \frac{BC}{\sin \alpha} = \frac{CA}{\sin 90^\circ} \rightarrow r \cdot CA \times \sin 10^\circ = AB \quad (4)$$

$$\sin 10^\circ = \frac{r \cdot \sqrt{3}}{r \sin \alpha}$$

$$\sin \alpha = \sqrt{3} \sin 10^\circ$$



مستطيل

$$\left. \begin{aligned} S_{ABE} &= \frac{1}{2} EB \times BA \times \sin B_1 \\ S_{BCD} &= \frac{1}{2} BC \times BD \times \sin B_2 \end{aligned} \right\} \rightarrow \frac{1}{18} = \frac{r}{9} \quad (5)$$

$B_1 = B_2$

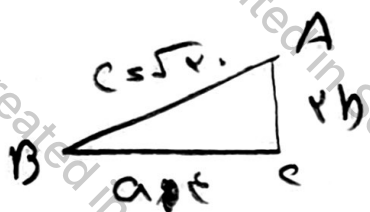


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$$S = \frac{1}{2} \times r \times r \times \sin 12^\circ \times r = 9\sqrt{3} \quad (6)$$



$$S = \frac{1}{2} \times r \times r \times \sin 12^\circ = 9\sqrt{3} \quad (7)$$



$$\rightarrow r^2 + r^2 = r^2 \times 2 = \sqrt{2} \quad \text{--- (1)}$$

$$\frac{a}{\sin A} = \frac{b}{\sin B} \rightarrow \frac{r}{\sin \alpha} = \frac{r}{\sin(\alpha - \pi)}$$

$$\rightarrow r \sin(\alpha - \pi) = \sin \alpha$$

$$\text{As } \tan \theta = \frac{r - r}{r + r} = \frac{1}{2}, \quad b = \frac{r}{2} \rightarrow b = \frac{1}{2}r$$

$$y = \frac{1}{2}x + \frac{3}{2}$$

$$0 = \frac{1}{2}x + \frac{3}{2}$$

$$\frac{1}{2}x = -\frac{3}{2}$$

$$x = -3$$

$$\rightarrow r^2 + r^2 = \sqrt{2}$$

$$r\sqrt{2} = \sqrt{2}$$

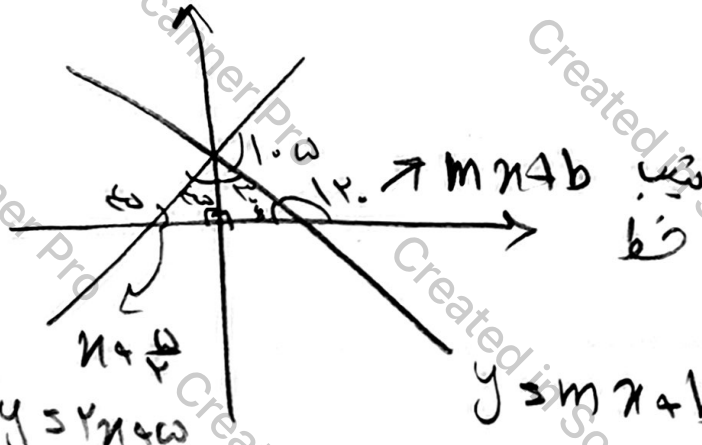
$$\cos \theta = \frac{1}{\sqrt{2}} = \frac{r}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{r\sqrt{2}}{2}$$



$$\rightarrow r^2 + r^2 = \sqrt{2}$$

$$r\sqrt{2} = \sqrt{2}$$

$$\cos \theta = \frac{1}{\sqrt{2}} = \frac{r}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{r\sqrt{2}}{2}$$



$$y = x + 0 \rightarrow m = 1$$

$$\tan \theta = 1 \rightarrow \theta = 45^\circ$$

$$y = mx + b \rightarrow m = \tan 135^\circ = -\sqrt{2}$$

$$\frac{0}{\sqrt{2}} \rightarrow \frac{0}{\sqrt{2}} = -\sqrt{2}(0) + b \rightarrow b = \frac{1}{\sqrt{2}}$$

$$mb = -\sqrt{2} \times \frac{1}{\sqrt{2}} = \frac{-\sqrt{2}}{\sqrt{2}}$$

$$f(x) = \cos(\pi + x) + \sin\left(\frac{\pi}{4} - x\right) - \tan\left(\frac{\pi}{4} + x\right) =$$

$$\frac{\pi}{4} \Rightarrow 120^\circ$$

$$= \cos \pi + \cos x + \cot x =$$

$$\cot x \rightarrow \cot 120^\circ = -\sqrt{3}$$

$$\sin\left(\frac{11\pi}{4} + x\right) + \cos\left(\frac{11\pi}{4} - x\right)$$

$$\cos(4\pi + x) - \sin(4\pi + x)$$

$$= \frac{\sin\left(\frac{\pi}{4} + 4\pi + x\right) + \cos\left(\frac{\pi}{4} + 4\pi - x\right)}{\cos(4\pi + \pi + x) - \sin(4\pi - x)}$$

$$\frac{\cos x - \sin x}{-\cos x + \sin x} = -1$$

$$AC = x$$

$$\begin{cases} AH + HC = x \\ AH = CH = \frac{x\sqrt{2}}{2} \end{cases}$$

$$\tan 45^\circ = \frac{x\sqrt{2}}{2} \rightarrow BH = \frac{x\sqrt{2}}{2} = \frac{x\sqrt{2}}{2}$$

$$AB = BH + AH = \frac{x\sqrt{2}}{2} + \frac{x\sqrt{2}}{2}$$

$$\frac{AB}{AC} = \frac{x(\sqrt{2} + \sqrt{2})}{x} = \frac{2\sqrt{2}}{1}$$