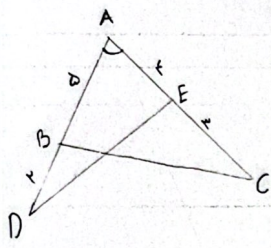
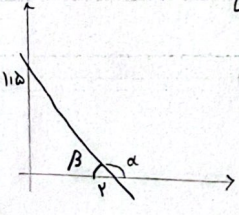


$S = abs \sin \alpha$, $a = 4K$, $b = 3K$ $\alpha = 150^\circ \Rightarrow \sin \alpha = \frac{1}{2}$
 $S = 4K \times 3K \times \frac{1}{2} = 6K^2 \Rightarrow 6K^2 = 18 \Rightarrow K = 3\sqrt{2}$
 $a = 4\sqrt{2}$, $b = 9\sqrt{2} \Rightarrow P = 2(4\sqrt{2} + 9\sqrt{2}) = 26\sqrt{2}$

$S_{ABC} - S_{ADE} = 11\sqrt{5}$

 $S_{ABC} = \frac{1}{2} \times 2 \times 7 \times \sin A = 7 \sin A$
 $S_{ADE} = \frac{1}{2} \times 1 \times 4 \times \sin A = 2 \sin A$
 $7 \sin A - 2 \sin A = 11\sqrt{5} \Rightarrow 5 \sin A = 11\sqrt{5} \Rightarrow \sin A = \frac{11\sqrt{5}}{5}$
 $\sin A = \frac{1}{2} \Rightarrow A = 30^\circ \Rightarrow \tan A = \frac{\sqrt{3}}{3}$

$\frac{1}{\sqrt{\cos^2 \alpha}} - \tan \alpha = \frac{1 + \sin \alpha}{|\cos \alpha|} \Rightarrow \frac{1}{\sqrt{\cos^2 \alpha}} - \frac{\sin \alpha}{\cos \alpha} = \frac{1 + \sin \alpha}{|\cos \alpha|} \Rightarrow \frac{-\sin \alpha}{\cos \alpha} = \frac{\sin \alpha}{|\cos \alpha|} \Rightarrow$
 $|\cos \alpha| = -\cos \alpha \Rightarrow \cos \alpha < 0$
 $\frac{|\sin \alpha|}{\cos \alpha} = \frac{1}{-\sin \alpha} \Rightarrow \frac{|\sin \alpha|}{\cos \alpha} = -\frac{1}{\sin \alpha} \Rightarrow |\sin \alpha| = -\sin \alpha$, $\sin \alpha < 0$
 در نتیجه هم $\sin \alpha$ و هم $\cos \alpha$ منفی و همان α در ناحیه سوم قرار می‌گیرد.

$\tan(\frac{\pi}{4} - \alpha) = \cot \alpha$ $\alpha + \beta = 180^\circ \Rightarrow -\cot \alpha = -\cot \beta$
 $\cot \beta = \frac{1}{\tan \beta} = \frac{1}{\frac{1}{\sqrt{3}}} = \sqrt{3} \Rightarrow \cot \alpha = \sqrt{3}$

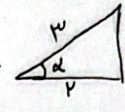


$\frac{3 \cos(144^\circ) - 2 \sin(144^\circ)}{\sin(144^\circ) - \cos(144^\circ)} = \frac{2 \sin(144^\circ - 108^\circ) - 3 \sin(108^\circ - 144^\circ)}{\sin(108^\circ + 144^\circ) - \cos(144^\circ + 144^\circ)}$
 $\frac{-3 \sin 144^\circ - 2 \sin 144^\circ}{-\sin 144^\circ - \sin 144^\circ} = \frac{-5 \sin 144^\circ}{-2 \sin 144^\circ} = \frac{5}{2}$

$$\frac{\sin(\frac{\pi}{4} + \alpha) - \sin(\alpha - \pi)}{|\tan^2 \alpha - 1|}$$

$$\cos \alpha = \frac{y}{r} \leftarrow \cos \alpha > 0, \sin \alpha < 0 \Leftrightarrow \alpha \text{ is in } 3^{\text{rd}} \text{ quadrant}$$

$$\frac{\cos \alpha + \sin \alpha}{|(\frac{\sqrt{2}}{2})^2 - 1|} = \frac{\frac{y}{r} - \frac{\sqrt{2}}{r}}{\frac{1}{r}} = \frac{1 - \sqrt{2}y}{y}$$

$$\tan \alpha = \frac{-\sqrt{2}}{y}, \sin \alpha = \frac{-\sqrt{2}}{r} \leftarrow$$


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$$\sin \alpha = r \cos \alpha, \sin \alpha, \cos \alpha < 0$$

$$\sin^2 \alpha + \cos^2 \alpha = 1 \rightarrow \cos^2 \alpha + \cos^2 \alpha = 1, \cos \alpha = 1$$

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

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$$ymx + (m^2 - 1)y = r \rightarrow \alpha = \tan^{-1} \frac{r}{y} = \sqrt{r} \Rightarrow \frac{-ym}{m^2 - 1} = \sqrt{r}$$

$$\sqrt{r} m^2 - \sqrt{r} = -ym \Rightarrow \sqrt{r} m^2 + ym - \sqrt{r} = 0 \quad \Delta = 14 \Rightarrow m = \frac{-y \pm \sqrt{14}}{2\sqrt{r}} = \frac{-y}{\sqrt{r}}, \frac{1}{\sqrt{r}}$$

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

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$$-\frac{\pi}{2} < x < \frac{\pi}{2}, \tan(\frac{\pi}{2} - x) = \frac{1 - m}{1 + m}$$

$$-\frac{\pi}{2} < x < \frac{\pi}{2} \xrightarrow{+\frac{\pi}{2}} 0 < \frac{\pi}{2} - x < \frac{\pi}{2} \Rightarrow \tan(\frac{\pi}{2} - x) > 0 \rightarrow \text{جیب در این حالت است}$$

$$\frac{1 - m}{1 + m} > 0, \frac{1 - y}{y - \frac{1}{2} + \frac{1}{2}} \Rightarrow -2 < m < 1$$

(5)

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$$\tan(40^\circ) \times \cos(40^\circ) + \tan(40^\circ) \times \sin(40^\circ)$$

$$\tan(40^\circ - 40^\circ) \times \cos(180^\circ + 40^\circ) + \tan(40^\circ - 40^\circ) \times \sin(180^\circ + 40^\circ)$$

$$-\tan 40^\circ \times -\cos 40^\circ + (-\tan 40^\circ \times \sin 40^\circ) = -\sqrt{r} \times -\frac{\sqrt{r}}{r} + (-\sqrt{r} \times \frac{\sqrt{r}}{r}) = \frac{r}{r} - \frac{r}{r} = 0$$

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