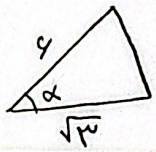
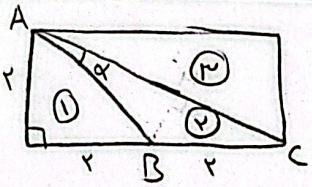


$S_\Delta = \frac{1}{2}ab\sin\alpha \rightarrow \frac{3\sqrt{3}}{2} = \frac{1}{2}\times 2\times\sqrt{3}\times\sin\alpha \rightarrow \sin\alpha = \frac{3}{2\sqrt{3}} = \frac{\sqrt{3}}{2} \rightarrow \alpha = 60^\circ \leftarrow \min$

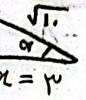
$\Rightarrow \frac{120}{60}$ (۲) ✓ $\qquad \alpha = 120^\circ \leftarrow \max$ (۱) (۲)



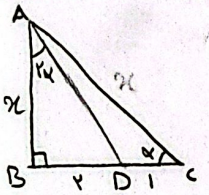
$AB = \sqrt{4+4} = 2\sqrt{2} \quad / \quad AC = \sqrt{4+16} = 2\sqrt{5}$

$S_T = 4\times 2 = 8$

$S_2 = 4$, $S_1 = 2$ $\Big\} S_3 = 2 \rightarrow 2 = \frac{1}{2}\times 2\sqrt{5}\times\sqrt{2}\times\sin\alpha$

$\sin\alpha = \frac{1}{\sqrt{10}} \rightarrow$ 

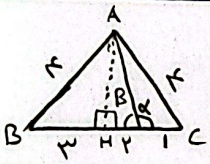
$\cot\alpha = \frac{3}{1}$ (۲) (۲) (۲)



$\tan 2\alpha = \frac{2\tan\alpha}{1-\tan^2\alpha} = \frac{2}{x}$ و $\tan\alpha = \frac{x}{3} \Rightarrow \frac{2}{x} = \frac{\frac{2x}{3}}{1-\frac{x^2}{9}} = \frac{6x}{9-x^2} \rightarrow 18-2x^2 = 6x^2$

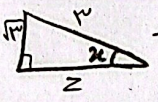
$18 = 8x^2 \rightarrow x^2 = \frac{9}{4} \rightarrow x = \frac{3}{2}$ (۲) (۳)

$\Rightarrow \cot\alpha = \frac{3}{x} = \frac{6}{3} = 2$ ✓

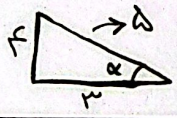


AH = ارتفاع و میانه $\rightarrow AH = \sqrt{16-9} = \sqrt{7} \rightarrow \tan\beta = \frac{\sqrt{7}}{2} \rightarrow \tan\alpha = \tan(\pi-\beta) = -\tan\beta$ (۴) (۲)

$\Rightarrow \tan\alpha = \frac{-\sqrt{7}}{2}$ ✓

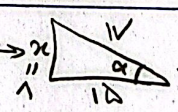
$\sin^2 x = \frac{1}{3} \rightarrow \sin x = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3} \rightarrow$  $\rightarrow z = \sqrt{9-3} = \sqrt{6} \rightarrow \left(\tan x = \frac{\sqrt{3}}{\sqrt{6}}\right)^2 \rightarrow \tan^2 x = \frac{3}{6} = \frac{1}{2}$ (۵) (۲) ✓

$\frac{\sin^6\alpha + 6(1-\sin^2\alpha)}{1+(1-\sin^2\alpha)} - \frac{\cos^6\alpha + 6(1-\cos^2\alpha)}{1+(1-\cos^2\alpha)} = \frac{(\sin^2\alpha-2)^3}{-(-2+\sin^2\alpha)} - \frac{(\cos^2\alpha-2)^3}{-(-2+\cos^2\alpha)} = -\sin^2\alpha+2+\cos^2\alpha-2 = \cos^2\alpha - \sin^2\alpha = \cos 2\alpha$ (۶) (۲) ✓



$\sin \rightarrow \ominus$, $\cos \rightarrow \ominus$ $\Big\} \rightarrow +\cos\alpha(-\sin\alpha) + \cot\alpha \rightarrow \frac{-3}{5}\left(\frac{4}{5}\right) + \frac{3}{4} = \frac{-48+75}{100} = \frac{27}{100}$ (۷) (۲) ✓

$3\cos\frac{\pi}{3} + \sqrt{2}\left(\sin\frac{\pi}{12} - \cos\frac{\pi}{12}\right) = \frac{3}{2} + \sqrt{2}\left(\sqrt{2}\sin\left(\frac{\pi}{12} - \frac{\pi}{4}\right)\right) = \frac{3}{2} + 2\sin\left(-\frac{\pi}{6}\right) = \frac{3}{2} - 1 = \frac{1}{2}$ (۸) (۲) ✓

$\left(\tan\left(\frac{\alpha}{2}\right)\right)^2 = \frac{1}{16} = \frac{1-\cos\alpha}{1+\cos\alpha} \rightarrow 1+\cos\alpha = 16-16\cos\alpha \rightarrow \cos\alpha = \frac{15}{17} \rightarrow$  $\rightarrow x = \sqrt{64} = 8$ (۹)

$\rightarrow \frac{\tan\alpha - \sin\alpha}{\sin\alpha - \cos\alpha} = \frac{\frac{8}{15} - \frac{8}{17}}{\frac{8}{17} - \frac{15}{17}} = \frac{\frac{136-120}{17\times 15}}{\frac{136-225}{17\times 17}} = \frac{16\times 17}{-7\times 17\times 15} = \frac{16}{-105}$ (۲) ✓

$0 < \frac{\cos\alpha}{\sin^2\alpha} \Rightarrow \cos\alpha > 0$ ناحیه ۱ یا ۴ $\quad / \quad 2\sin\alpha < 2\sin\alpha\cos\alpha \rightarrow 1 < \cos\alpha$

(✗) همواره غیرممکن $-1 < \cos\alpha < 1$

پس جهت عوض شده $\Leftarrow \sin\alpha < 0 \Leftarrow$ ناحیه ۳ یا ۴ $\quad / \Rightarrow \alpha \rightarrow$ در ناحیه چهارم

(۲) (۱۰)