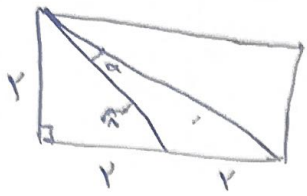
۱) (۲)

$\frac{1}{2}ab\sin A = S \Rightarrow 60 = \frac{1}{2}\times 10\sqrt{2}\times x\sin 45 \Rightarrow \sin A = \frac{\sqrt{2}}{2}$

$\frac{120}{60} = 2$ ✓ $A = 60^\circ, 120^\circ$

۲) (۲)



$\sqrt{6+2} = \sqrt{8}$

$\sqrt{12+8} = \sqrt{20}$

$c = \sqrt{a^2+b^2-2ab\cos\alpha}$

$2 = \sqrt{20+20-2\sqrt{120}\cos\alpha}$

$2 = \sqrt{40-8\sqrt{10}\cos\alpha}$

$4 = 40 - 8\sqrt{10}\cos\alpha$

$8\sqrt{10}\cos\alpha = 36$

$\sqrt{10}\cos\alpha = 3$

$\cos\alpha = \frac{3}{\sqrt{10}}$

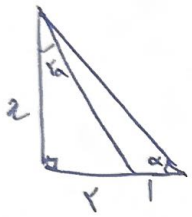
$\sin^2 2 + \cos^2 = 1$

$\sin^2 2 + \frac{9}{10} = 1$

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

$\cot\alpha = \frac{3}{\frac{1}{\sqrt{10}}} = 3$ ✓

۳) (۲)



$\tan\alpha = \frac{x}{3}$ $\tan 2\alpha = \frac{y}{8}$

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

$\frac{6x}{9-x^2} = \frac{y}{8}$

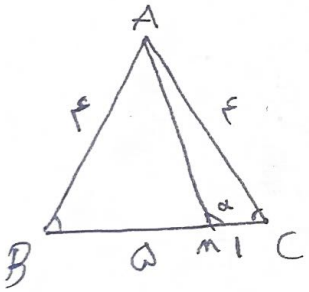
$\cot\alpha = \frac{3}{\frac{x}{3}} = 3$ ✓

$8y = 18 - 2x^2$

$8x^2 = 18$ $x^2 = \frac{9}{4}$ $x = \frac{3}{2}$

$4x^2 = 9$

۴) (۲)



$AM = \sqrt{25+16-40\cos C}$

$AM = \sqrt{41-40\cdot\frac{3}{4}}$

$AM = \sqrt{11}$

$16 = 16+16-32\cos C$

$32\cos C = 32$

$4\cos C = 3$

$\cos C = \frac{3}{4}$

$\sin C = \frac{\sqrt{7}}{4}$

$\frac{\sqrt{11}}{\sin 45} = \frac{4}{\sin\alpha}$

$\sin\alpha = \frac{\sqrt{7}}{\sqrt{11}}$

$\cos\alpha = \frac{2}{\sqrt{11}}$

$\tan\alpha = \frac{\frac{\sqrt{7}}{\sqrt{11}}}{\frac{2}{\sqrt{11}}} = \frac{\sqrt{7}}{2}$ ✓

۵) (۲)

$\sin^2 + 1 = \frac{4}{3}$ $\sin^2 = \frac{1}{3}$ $\frac{1}{\sin^2} + \frac{2}{3} = 1$

$\sin = \frac{\sqrt{3}}{3}$ $\cos = \frac{\sqrt{2}}{\sqrt{3}}$ $\tan = \frac{\frac{1}{\sqrt{3}}}{\frac{\sqrt{2}}{\sqrt{3}}} = \frac{1}{\sqrt{2}}$

$\tan^2\alpha = \frac{1}{2}$ ✓

۶) (۲)

$$\frac{\sin^4\alpha + 4\cos^2\alpha}{1+\cos^2\alpha} - \frac{\cos^4\alpha + 2\sin^2\alpha}{1+\sin^2\alpha}$$

$(\sin^2\alpha)^2 = (1-\cos^2)^2 = 1+\cos^4 - 2\cos^2$

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

$(\cos^2\alpha)^2 = (1-\sin^2\alpha)^2 = 1+\sin^4\alpha - 2\sin^2\alpha$

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

$2+\cos^2\alpha - 2 - \sin^2\alpha$

$\cos^2\alpha - \sin^2\alpha = \cos 2\alpha$ ✓

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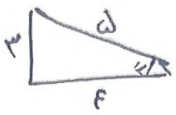
۷) (۲)

$\cos(\alpha)\times - \sin(\alpha) + \cot(\alpha)$



$\sin\alpha = -\frac{3}{5}$

$\cos\alpha = -\frac{4}{5}$

$-\frac{4}{5}\times + \frac{3}{5}$

$\frac{-12}{20} + \frac{3}{4} = \frac{-48+75}{100} = \frac{27}{100}$ ✓

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۸) (۲)

$2\cos 2\alpha + \sqrt{2}\sin\alpha - \sqrt{2}\cos\alpha$

$2\cos\frac{\pi}{2} + \sqrt{2+2}\sin(\alpha + \frac{\pi}{4})$

$\tan\alpha = \frac{2}{2}$

$\frac{1}{2}$

$\sin(\frac{\pi}{2} + \frac{\pi}{12})$

$\frac{\alpha}{2} + \frac{\pi}{4}$

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۹) (۲)

$\frac{\tan\alpha - \sin\alpha}{\sin\alpha - \cos\alpha}$

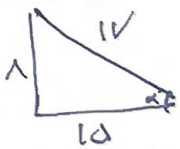
$\tan(\frac{\alpha}{2}) = \frac{1}{2}$

$\tan\alpha = \frac{2\tan(\frac{\alpha}{2})}{1-\tan^2(\frac{\alpha}{2})} = \frac{\frac{1}{2}}{\frac{15}{16}} = \frac{8}{15}$

$\frac{\frac{8}{15} - \frac{8}{17}}{\frac{8}{17} - \frac{15}{17}} = \frac{\frac{136-120}{255}}{\frac{-7}{17}} = \frac{\frac{16}{255}\cdot 15}{-\frac{7}{17}} = -\frac{16}{105}$ ✓

$\sin\alpha = \frac{8}{17}$

$\cos\alpha = \frac{15}{17}$



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۱۰) (۲)

$2\sin\alpha < \sin 2\alpha$

$0 < \frac{\cot\alpha}{\sin\alpha}$

ناحیه ۱ و ۳

ناحیه چهارم ✓

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۱۱) (۲)

$2\cos 2\alpha + \sqrt{2}(\sin\alpha - \cos\alpha)$

$\sqrt{2}(\sin(\alpha - \frac{\pi}{4}))$

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