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۱- الف) $(\sin 135 + \sin 225)(\cos 315 + \cos 150) = \left(\frac{\sqrt{2}+\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}+\sqrt{3}}{2}\right)$

$\Rightarrow \frac{1}{2}\times(\sqrt{2}-\sqrt{3})(\sqrt{2}+\sqrt{3})\frac{1}{2} \Rightarrow \frac{1}{4}(2-3) = \boxed{-\frac{1}{4}}$

ب) $\frac{1+\tan^2 210}{4\cos^2 330 + 2\cos^2 225} = \frac{2}{2} = \boxed{1}$

۲-

الف) $AH = \frac{\sqrt{12}}{2} = \frac{2\sqrt{3}}{2} = \sqrt{3}$ $\qquad \frac{\sqrt{2}}{2\sqrt{2}} = \frac{1}{2} = \sin 30^\circ$

$Hc = \cos\alpha \times 2\sqrt{2} \Rightarrow \frac{\sqrt{2}}{2} \times 2\sqrt{2} = \boxed{3}$

ب) $AC = \frac{9}{\frac{\sqrt{3}}{2}} = \frac{18}{\sqrt{3}}$ $\qquad AH = \frac{18}{\sqrt{3}} \times \frac{1}{2} = \frac{9}{\sqrt{3}}$

$\sin\beta = \frac{\frac{3\sqrt{3}}{\sqrt{3}}}{\frac{3\sqrt{6}}{1}} = \frac{\frac{3\sqrt{2}}{3}}{\frac{\sqrt{6}}{1}} = \frac{\sqrt{2}}{2} \Rightarrow \beta = 45^\circ$

۳- الف) $AC = \frac{\frac{50\sqrt{3}}{1}}{\frac{1}{2}} = 100\sqrt{3}$ $\qquad BC = 100\sqrt{3} \times \sqrt{\frac{2}{4}} = 120$

$AD = \frac{\frac{50\sqrt{3}}{1}}{\frac{\sqrt{3}}{2}} = 100 \Rightarrow BD = 100 \times \frac{1}{2} = 50$

$\alpha = 120 - 90 = \boxed{100}$

ب) $AC = \frac{2}{\cos 60} = 4$ $\qquad \tan\alpha = \frac{1}{2\sqrt{3}} = \frac{\sqrt{12}}{12} = \frac{2\sqrt{3}}{12} = \frac{\sqrt{3}}{6}$

$BC = 2\sqrt{3}$ $\qquad 1+\cot^2\alpha = \frac{1}{\sin^2\alpha} \Rightarrow 1+\left(\frac{6}{\sqrt{3}}\right)^2 = \frac{1}{\sin^2\alpha} \Rightarrow 1+\frac{36}{3} = \frac{1}{\sin^2\alpha}$

$13 = \frac{1}{\sin^2\alpha} \Rightarrow \sin^2\alpha = 13 \Rightarrow \sin\alpha = \sqrt{13}$

۴- $S_{ABE} = \frac{1}{2} \times 2 \times 4 \times \sin\alpha$

$\alpha_1 = \alpha_2$

$S_{BCD} = \frac{1}{2} \times 3 \times 6 \times \sin\alpha$ $\qquad \frac{S_{ABE}}{S_{BCD}} = \frac{\frac{1}{2}\times 2\times 4\times\sin\alpha}{\frac{1}{2}\times 3\times 6\times\sin\alpha} = \frac{4}{9}$

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۵- $CH = \frac{x}{2} \Rightarrow CA = \frac{\frac{x}{2}}{\frac{\sqrt{2}}{2}} = \frac{x}{\sqrt{2}} = \frac{\sqrt{2}x}{2}$

$AH = \frac{x}{2}$ $\quad BH = \frac{\sqrt{3}}{2} \times x$

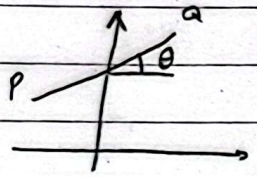
$AB = AH + BH = \left(\frac{1+\sqrt{3}}{2}\right)x$ $\quad \frac{AB}{AC} = \frac{\left(\frac{1+\sqrt{3}}{2}\right)x}{\left(\frac{\sqrt{3}}{x}\right)x} = \boxed{\frac{1+\sqrt{3}}{\sqrt{2}}}$

۶- الف) $S = \left(\frac{1}{2} \times \underbrace{\sin 120}_{\frac{\sqrt{3}}{2}} \times 2\sqrt{2} \times 4\right) \times 2 = 4\sqrt{3}$

ب) $S = \frac{1}{2} \times ab \sin\alpha = \frac{1}{2} \times 4 \times 2\sqrt{2} \sin 120 = 2\sqrt{3}$

$a = 4 \quad b = 2$

۷- $\tan pq = \frac{\Delta y}{\Delta x} = \frac{4-2}{2-(-1)} = \frac{2}{4} = \frac{1}{2}$



$1 + \tan^2\alpha = \frac{1}{\cos^2\alpha} \Rightarrow 1 + \frac{1}{4} = \frac{1}{\cos^2\alpha} = \frac{3}{4} = \frac{1}{\cos^2\alpha} \Rightarrow \cos^2\alpha = \frac{4}{3}$

$\boxed{\cos\alpha = \frac{2}{\sqrt{3}}}$

۸-

۹- $f(x) = \cos(x+\pi) + \sin\left(\frac{x}{2} - \pi\right) - \tan\left(\frac{2x}{2} + \pi\right) \Rightarrow \left(\frac{1}{\sqrt{2}+1}\right) = \boxed{\frac{-1}{\sqrt{2}+1}}$

$\cos(120+120) = -1 \alpha - \frac{\sqrt{3}}{2} - (\cancel{0 \times \sin\beta}) = \frac{\sqrt{3}}{2} + 0$

$\sin(90-120) = 1 \times -\frac{\sqrt{3}}{2} + \frac{1}{2} \times 0 = -\frac{\sqrt{3}}{2}$ $\quad \tan(270+120) = \frac{\frac{1}{\sqrt{3}}}{1-(-\frac{1}{\sqrt{3}})+\frac{1}{\sqrt{3}}} = \frac{1}{\sqrt{2}+1}$

$f\left(\frac{5\pi}{6}\right) = f(120)$

۱۰- $\frac{\sin\left(\frac{17\pi}{2}+x\right) + \cos\left(\frac{13\pi}{2}+x\right)}{\cos(2\pi x+2) - \sin(6x-x)} \Rightarrow \frac{\sin(8\pi+x) + \cos(270-x)}{\cos(2\pi+x) + \sin(6\pi-x)} = \frac{\cos x + \sin x}{-\cos x + \sin x}$

+ cos x sin x − cos x

$\frac{17\pi}{2} = 90^\circ \quad 6\pi = 180^\circ$

$\frac{13\pi}{2} = 270^\circ \quad 2\pi = 180^\circ$

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