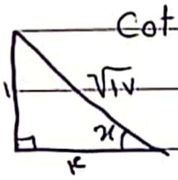
۱- الف) $\tan\frac{11\pi}{4}+\sin\frac{15\pi}{4}\cos\frac{13\pi}{4}=\tan(\frac{8\pi}{4}+\frac{3\pi}{4})+\sin(\frac{12\pi}{4}+\frac{3\pi}{4})\cos(\frac{12\pi}{4}+\frac{\pi}{4})=-1$

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

ب) $\tan\frac{17\pi}{6}\sin\frac{11\pi}{3}+\cos\frac{10\pi}{3}=\tan(\frac{12\pi}{6}+\frac{5\pi}{6})\sin(\frac{6\pi}{3}+\frac{5\pi}{3})+\cos(\frac{6\pi}{3}+\frac{4\pi}{3})$

$=-\frac{\sqrt{3}}{3}\times(+\frac{\sqrt{3}}{2})+\frac{1}{2}=0$

۲- $\cot x=4$



$\frac{3\cos x-\sin x}{\cos x+\sin x}=\frac{3(\frac{4}{\sqrt{17}})-\frac{1}{\sqrt{17}}}{\frac{4}{\sqrt{17}}+\frac{1}{\sqrt{17}}}=\frac{\frac{11}{\sqrt{17}}}{\frac{5}{\sqrt{17}}}=\frac{11}{5}$

$\cos x=\frac{4}{\sqrt{17}}$ $\quad\sin x=\frac{1}{\sqrt{17}}$

۳- $\sin\alpha=2\cos\alpha,\ \sin^2+\cos^2=1\Rightarrow(2\cos)^2+\cos^2=1\rightarrow5\cos^2=1\rightarrow\cos^2=\frac{1}{5}\rightarrow\cos=-\sqrt{\frac{1}{5}}=\frac{-1}{\sqrt{5}}$

(چون ناحیه سوم است منفی صحیح است) ⊖

۴-

الف) $\cos(\frac{11\pi}{4}+\alpha)=\cos(2\pi+\frac{3\pi}{4}+\alpha)=\cos(\frac{3\pi}{4}+\alpha)=\cos\frac{3\pi}{4}\cos\alpha-\sin\frac{3\pi}{4}\sin\alpha=$

$\cos^2=1-\sin^2=1-(\frac{-\sqrt{2}}{10})^2=+\frac{98}{100}\Rightarrow\cos\alpha=\ominus\frac{7\sqrt{2}}{10}$ (ناحیه ۲) $\;(-\frac{\sqrt{2}}{2})(\frac{-7\sqrt{2}}{10})-(\frac{\sqrt{2}}{2})(\frac{\sqrt{2}}{10})=$

$\frac{14}{20}-\frac{2}{20}=\frac{12}{20}=\frac{3}{5}$

ب) $\sin(\frac{13\pi}{4}+\alpha)=\sin(\frac{8\pi}{4}+\frac{5\pi}{4}+\alpha)=\sin(\frac{5\pi}{4}+\alpha)=(\frac{-\sqrt{2}}{2})\cos\alpha+(\frac{-\sqrt{2}}{2})\sin\alpha$ $\quad(\frac{7\sqrt{2}}{10},\ \frac{\sqrt{2}}{10})$

$=\frac{-14}{20}-\frac{2}{20}=\frac{-16}{20}=\frac{-4}{5}$

$\tan^2+1=\frac{1}{\cos^2}\Rightarrow(\frac{1}{7})^2+1=\frac{1}{\cos^2}\Rightarrow\cos=\oplus\frac{7}{\sqrt{50}}=\frac{7\sqrt{2}}{10}$ (ناحیه ۱)

$\sin^2=1-\cos^2=1-(\frac{7\sqrt{2}}{10})^2=\frac{1}{50}\Rightarrow\sin=\oplus\frac{1}{\sqrt{50}}=\frac{\sqrt{2}}{10}$ (ناحیه ۱)

۵-

$2\sin^2x+\cos^2x=\frac{4}{3}\Rightarrow2(1-\cos^2x)+\cos^2x=\frac{4}{3}\Rightarrow\cos^2x=\frac{2}{3}\Rightarrow\sin^2=1-\frac{2}{3}=\frac{1}{3}\Rightarrow$

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

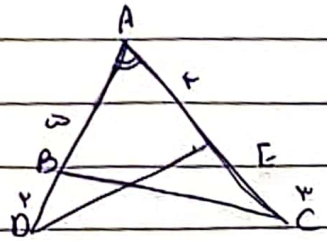
۶-

$S_{ABC}=\frac{1}{2}\times\sqrt{3}\times6\times\sin\alpha=4.5\Rightarrow\sin\alpha=\frac{\sqrt{3}}{2},\ 0<\alpha<\pi\Rightarrow\alpha=\begin{cases}60^\circ \text{ یا } \frac{\pi}{3} \ ①\\ 120^\circ \text{ یا } \frac{2\pi}{3}\end{cases}\rightarrow\frac{120}{60}=\frac{\frac{2\pi}{3}}{\frac{\pi}{3}}=2$

۵- $a=2x$, $b=3x$ $\Rightarrow S=ab\sin\alpha=(2x)(3x)\sin 150^\circ=6x^2\times\frac{1}{2}=3x^2=24\Rightarrow$

$x=2\sqrt{2}\Rightarrow a=2(3\sqrt{2})=6\sqrt{2}$, $b=3(3\sqrt{2})=9\sqrt{2}$

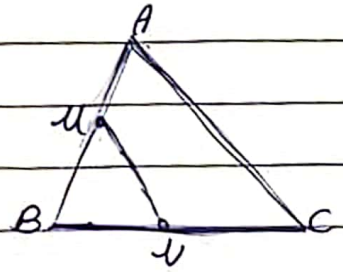
۸-



$S_{ABC}=\frac{1}{2}\times 3\times 4\times\sin\hat{A}=12\sin\hat{A}$ $\Big\}\Rightarrow 12\sin\hat{A}=12\sin\hat{A}$

$S_{ADE}=\frac{1}{2}\times 2\times 2\times\sin\hat{A}=2\sin\hat{A}$ $\Big\}=1, 2a\Rightarrow a=\frac{1}{2}\Rightarrow\sin\hat{A}=\frac{1}{2}\Rightarrow\hat{A}=30^\circ\Rightarrow\tan 30^\circ=\frac{1}{\sqrt{3}}$

۹-



$S_{ABC}=3S_{BMN}\Rightarrow\frac{1}{2}\times AB\times BC\times\sin\hat{B}=3\times\frac{1}{2}\times BM\times BN\times\sin\hat{B}\Rightarrow$

$(\overline{AM}+\overline{MB})\times(\overline{BN}+\overline{NC})=3(\overline{BM}\times\overline{BN})\Rightarrow(\overline{AM}+\overline{MB})\times\frac{2}{3}\overline{BN}$

$=3\times BM\times BN\Rightarrow\frac{2}{3}\overline{AM}+\frac{2}{3}\overline{MB}=2\overline{BM}\Rightarrow\overline{BM}=\frac{2}{5}\overline{AM}\Rightarrow$

$\frac{BM}{AM}=\frac{2}{5}\frac{AM}{AM}=\frac{2}{5}$

$3BN=3CN\Rightarrow$

$CN=\frac{2}{3}BN\Rightarrow\overline{BN}+\overline{NC}=\frac{2}{3}B$

۱۰-

① $\frac{1}{\sqrt{\cos^2\alpha}}-\tan\alpha=\frac{1+\sin\alpha}{|\cos\alpha|}\Rightarrow-\tan\alpha=\frac{1+\sin\alpha-1}{|\cos\alpha|}=\frac{\sin\alpha}{|\cos\alpha|}$

② $\frac{|\sin\alpha|}{\cos\alpha}=-\frac{1}{\cot\alpha}\Rightarrow\frac{|\sin\alpha|}{\cos\alpha}=-\tan\alpha$

الف $\Rightarrow\frac{-\sin\alpha}{\cos\alpha}=\frac{\sin\alpha}{|\cos\alpha|}\xrightarrow{\times\frac{1}{\sin\alpha}}\frac{-1}{\cos\alpha}=\frac{1}{|\cos\alpha|}\Rightarrow+\cos\alpha=-|\cos\alpha|\Rightarrow\cos\alpha<0$

ب $\Rightarrow\frac{-\sin\alpha}{\cos\alpha}=\frac{|\sin\alpha|}{\cos\alpha}\Rightarrow-\sin\alpha=|\sin\alpha|\Rightarrow\sin<0$