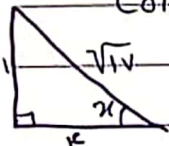


$$\text{الف) } \tan \frac{11\pi}{6} + \sin \frac{12\pi}{6} \cos \frac{13\pi}{6} = \tan \left(\frac{11\pi}{6} + \frac{13\pi}{6} \right) + \sin \left(\frac{12\pi}{6} + \frac{13\pi}{6} \right) \cos \left(\frac{12\pi}{6} + \frac{13\pi}{6} \right) \\ = -1 + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} = -\frac{1}{2}$$

$$\text{ب) } \tan \frac{10\pi}{9} \sin \frac{11\pi}{9} + \cos \frac{10\pi}{9} = \tan \left(\frac{10\pi}{9} + \frac{11\pi}{9} \right) \sin \left(\frac{10\pi}{9} + \frac{11\pi}{9} \right) + \cos \left(\frac{10\pi}{9} + \frac{11\pi}{9} \right) \\ = -\frac{\sqrt{3}}{2} \times \left(\pm \frac{\sqrt{3}}{2} \right) + \frac{1}{2} = 0$$



$$\cot \alpha = \frac{1}{\sqrt{11}} \quad \frac{\sqrt{11} \cos \alpha - \sin \alpha}{\cos \alpha + \sin \alpha} = \frac{\sqrt{11} \left(\frac{1}{\sqrt{11}} \right) - \frac{1}{\sqrt{11}}}{\frac{1}{\sqrt{11}} + \frac{1}{\sqrt{11}}} = \frac{\frac{11}{\sqrt{11}}}{\frac{2}{\sqrt{11}}} = \frac{11}{2}$$

$$\cos \alpha = \frac{1}{\sqrt{11}} \quad \sin \alpha = \frac{1}{\sqrt{11}}$$

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

$$\text{الف) } \cos \left(\frac{11\pi}{6} + \alpha \right) = \cos \left(\frac{11\pi}{6} + \frac{13\pi}{6} + \alpha \right) = \cos \left(\frac{24\pi}{6} + \alpha \right) = \cos \frac{24\pi}{6} \cos \alpha - \sin \frac{24\pi}{6} \sin \alpha = \\ \cos^2 \alpha - \sin^2 \alpha = 1 - \left(\frac{\sqrt{3}}{2} \right)^2 = 1 - \frac{3}{4} = \frac{1}{4} \Rightarrow \cos \alpha = \frac{1}{2}$$

$$\frac{1}{2} = \frac{1}{2} \Rightarrow \cos \alpha = \frac{1}{2} \Rightarrow \alpha = \frac{\pi}{3}$$

$$\text{ب) } \sin \left(\frac{13\pi}{6} + \alpha \right) = \sin \left(\frac{13\pi}{6} + \frac{11\pi}{6} + \alpha \right) = \sin \left(\frac{24\pi}{6} + \alpha \right) = \sin \frac{24\pi}{6} \cos \alpha + \cos \frac{24\pi}{6} \sin \alpha = \\ = \frac{1}{2} \cos \alpha + \frac{\sqrt{3}}{2} \sin \alpha = \frac{1}{2} \cos \alpha + \frac{\sqrt{3}}{2} \sin \alpha = \frac{1}{2}$$

$$\tan^2 \alpha + 1 = \frac{1}{\cos^2 \alpha} \Rightarrow \left(\frac{1}{2} \right)^2 + 1 = \frac{1}{\cos^2 \alpha} \Rightarrow \cos^2 \alpha = \frac{4}{5} \Rightarrow \cos \alpha = \frac{2}{\sqrt{5}}$$

$$\sin^2 \alpha = 1 - \cos^2 \alpha = 1 - \left(\frac{4}{5} \right) = \frac{1}{5} \Rightarrow \sin \alpha = \frac{1}{\sqrt{5}}$$

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

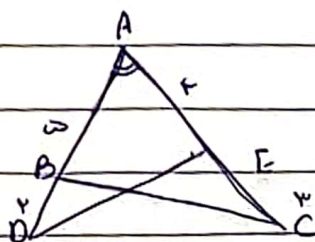
$$\tan^2 \alpha = \frac{\sin^2 \alpha}{\cos^2 \alpha} = \frac{\frac{1}{5}}{\frac{1}{5}} = 1 \Rightarrow \tan \alpha = 1$$

$$S_{ABC} = \frac{1}{2} \times \sqrt{3} \times 4 \times \sin \alpha = \frac{1}{2} \times \sqrt{3} \times 4 \times \frac{1}{2} = \sqrt{3}$$

$$a = 2x, b = 3x \rightarrow S = ab \sin \alpha = (2x)(3x) \sin 120^\circ = 6x^2 \times \frac{\sqrt{3}}{2} = 3\sqrt{3}x^2 = 9\sqrt{3} \quad -1$$

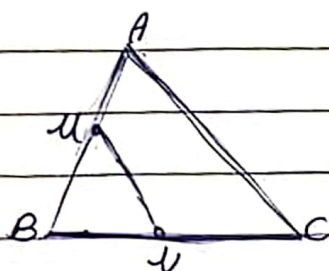
$$x = 3\sqrt{3} \rightarrow \alpha = 2(3\sqrt{3}) = 6\sqrt{3}, b = 3(3\sqrt{3}) = 9\sqrt{3}$$

$$S = (2x + 3x) \times \sqrt{3} \rightarrow 10x = 3\sqrt{3} \quad 110$$



$$S_{ABC} = \frac{1}{2} \times 2 \times 2 \times \sin \hat{A} = 2 \sin \hat{A} \quad S_{ADE} = \frac{1}{2} \times 1 \times 1 \times \sin \hat{A} = \frac{1}{2} \sin \hat{A}$$

$$\frac{S_{ADE}}{S_{ABC}} = \frac{\frac{1}{2} \sin \hat{A}}{2 \sin \hat{A}} = \frac{1}{4} \Rightarrow \frac{S_{ADE}}{S_{ABC}} = \left(\frac{AP}{AD}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$$



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

$$(AM + MB) \times (BN + NC) = 3(BM \times BN) \Rightarrow (AM + MB) \times \frac{2}{3} BM = 3BM \times \frac{1}{3} BN$$

$$\frac{BM}{AM} = \frac{1}{2} \Rightarrow \frac{BM}{AM} = \frac{1}{2} \Rightarrow \frac{BM}{AM} = \frac{1}{2}$$

$$BM = \frac{1}{3} BN \Rightarrow BM + NC = \frac{2}{3} BN$$

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

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

$$\text{L.H.S} \Rightarrow \frac{-\sin \alpha}{\cos \alpha} = \frac{\sin \alpha}{|\cos \alpha|} \times \frac{1}{\sin \alpha} = \frac{-1}{\cos \alpha} = \frac{1}{|\cos \alpha|} \Rightarrow +\cos \alpha = -|\cos \alpha| \Rightarrow \cos \alpha < 0$$

$$\text{R.H.S} \Rightarrow \frac{-\sin \alpha}{\cos \alpha} = \frac{|\sin \alpha|}{\cos \alpha} \Rightarrow -\sin \alpha = |\sin \alpha| \Rightarrow \sin \alpha < 0$$

3rd