

Q1

$$\sec \theta = \frac{1}{\cos \theta} \quad \cot \theta = \frac{1}{\tan \theta} \quad \operatorname{cosec} \theta = \frac{1}{\sin \theta}$$

$$\tan = \frac{\sin \theta}{\cos \theta}$$

$$\frac{1}{\cos \theta} \cdot \frac{1}{\tan \theta} = \frac{1}{\sin \theta} \cdot \frac{\sin \theta}{\cos \theta}$$

$$\frac{1}{\cancel{\cos \theta} \tan \theta} \cdot \frac{\cancel{\cos \theta}}{1}$$

$$\frac{1}{\tan \theta} = \cot \theta = -\sqrt{3}$$

$$\tan \theta = -\frac{1}{\sqrt{3}} \text{ or } -\frac{\sqrt{3}}{3}$$

$$\tan^{-1}\left(-\frac{\sqrt{3}}{3}\right) = -\frac{1}{6}\pi + \pi$$

$$\theta = -\frac{1}{6}\pi, \frac{5}{6}\pi$$

Q2

16]

MULTIPLY FACTORISE SOLVE

$$6 \sec^2 \theta + 2\sqrt{3} = (-3 - 4\sqrt{3}) \sec \theta$$

$$6 \sec^2 \theta + (3 + 4\sqrt{3}) \sec \theta + 2\sqrt{3} = 0$$

$$(3 \sec \theta + 2\sqrt{3}) (2 \sec \theta + 1) = 0$$

SOLVE

$$3 \sec \theta + 2\sqrt{3} = 0 \quad 2 \sec \theta + 1 = 0$$

$$\sec \theta = -\frac{2\sqrt{3}}{3} \quad \sec \theta = -\frac{1}{2}$$

$$\frac{1}{\cos \theta} = -\frac{2\sqrt{3}}{3}$$

$$\sec \theta = k$$

NO SOLUTIONS

$$\cos \theta = -\frac{3}{2\sqrt{3}} = -\frac{\sqrt{3}}{2}$$

FOR $-1 < k < 1$

$$\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right) = \frac{5}{6}\pi$$

SYMMETRICAL AROUND π

$$\theta = \frac{7}{6}\pi$$

$$\theta = \frac{5}{6}\pi, \frac{7}{6}\pi$$

EXPAND LHS

$$\frac{\operatorname{cosec} x}{\sec x} + \cancel{x} \cancel{x} - \frac{\sec x}{\operatorname{cosec} x}$$

$$\operatorname{cosec} x = \frac{1}{\sin x} \quad \sec x = \frac{1}{\cos x}$$

$$\frac{\cos x}{\sin x} - \frac{\sin x}{\cos x} = \frac{\cos^2 x - \sin^2 x}{\sin x \cos x}$$

$$\times \frac{2}{2} \quad \frac{2\cos^2 x - \sin^2 x}{2\sin x \cos x} = \frac{2\cos 2x}{\sin 2x}$$

DOUBLE
ANGLE

$$\cot x = \frac{\cos x}{\sin x} \quad \text{LHS} = 2\cot 2x$$

$$2 \cot 2x = \cot 2x + 3$$

$$\cot 2x = 3$$

SOLVE

$$\frac{1}{\tan 2x} = 3$$

$$\tan 2x = \frac{1}{3}$$

LET $z = 2x$

RANGE $-2\pi < 2x < 2\pi$

$$\tan^{-1}\left(\frac{1}{3}\right) = 0.32175$$

$$-2\pi, -\pi, +\pi$$

$$z = -5.96, -2.82, 0.322, 3.46$$

$$\left. \begin{array}{l} \downarrow \\ \div 2 \end{array} \right\}$$

$$x = -2.98, -1.41, 0.161, 1.73$$

(3sf)

$$1 + \cot^2 x \equiv \operatorname{cosec}^2 x \quad [6]$$

$$\cot^2 x \equiv \operatorname{cosec}^2 x - 1$$

$$3(\operatorname{cosec}^2 x - 1) - 4\sqrt{3} = (6 - 2\sqrt{3})\operatorname{cosec} x - 3$$

$$3\operatorname{cosec}^2 x - 3 + (2\sqrt{3} - 6)\operatorname{cosec} x + 3 - 4\sqrt{3} = 0$$

$$3\operatorname{cosec}^2 x + (2\sqrt{3} - 6)\operatorname{cosec} x - 4\sqrt{3} = 0$$

$$(3\operatorname{cosec} x + 2\sqrt{3})(\operatorname{cosec} x - 2) = 0$$

SOLVE

$$3\operatorname{cosec} x + 2\sqrt{3} = 0 \quad \operatorname{cosec} x - 2 = 0$$

$$\operatorname{cosec} x = -\frac{2\sqrt{3}}{3}$$

$$\operatorname{cosec} x = 2$$

$$\frac{1}{\sin x} = -\frac{2\sqrt{3}}{3}$$

$$\frac{1}{\sin x} = 2$$

$$\sin x = -\frac{3}{2\sqrt{3}} = -\frac{\sqrt{3}}{2}$$

$$\sin x = \frac{1}{2}$$

$$\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) = -\frac{1}{3}\pi$$

$$\sin^{-1}\left(\frac{1}{2}\right) = \frac{1}{6}\pi$$

$$\text{OUT OF RANGE}$$

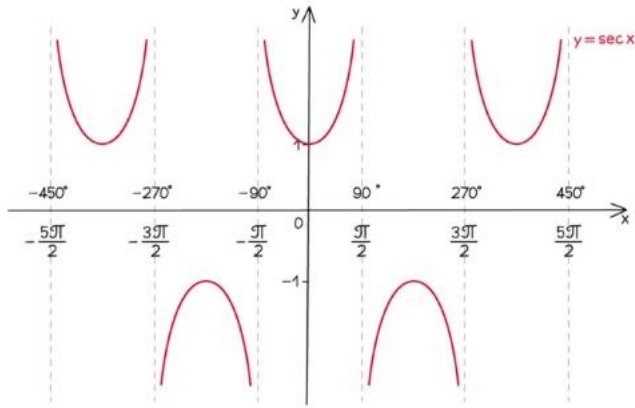
$$\pi - \frac{1}{6}\pi = \frac{5}{6}\pi$$

$$\pi + \frac{1}{3}\pi = \frac{4}{3}\pi$$

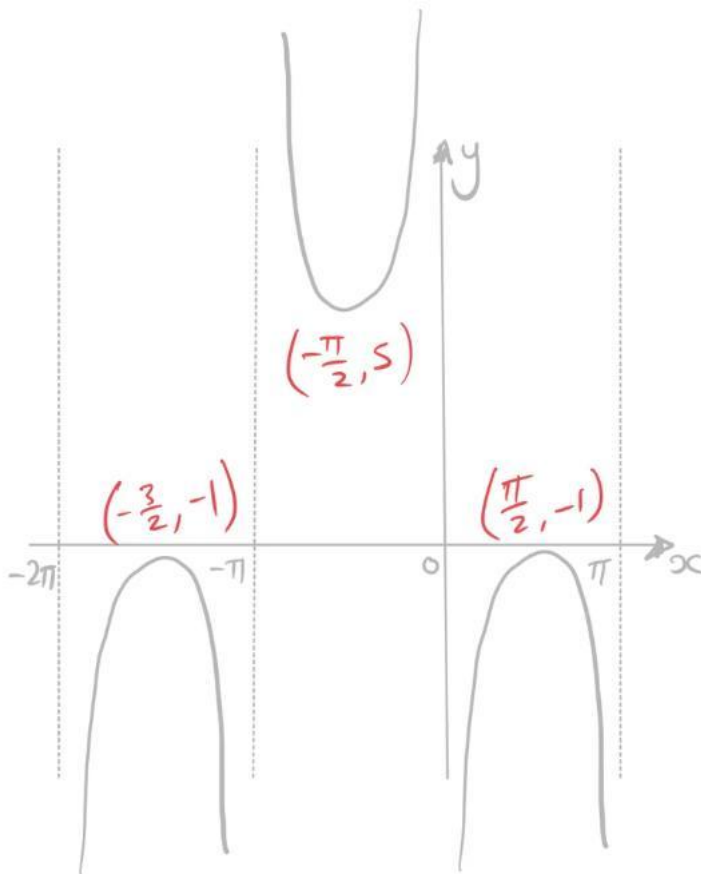
$$2\pi - \frac{1}{3}\pi = \frac{5}{3}\pi$$

$$x = \frac{\pi}{6}, \frac{4}{3}\pi, \frac{5}{3}\pi, \frac{5}{6}\pi$$

TRANSLATE $\left(-\frac{\pi}{2}\right)$
 VERTICAL STRETCH SF 3
 TRANSLATE $\left(\begin{smallmatrix} 0 \\ 2 \end{smallmatrix}\right)$



a)



Q5b

b)

y VALUES

1

$$\text{MAX} = \frac{1}{\text{MIN}} \text{ POSITIVE (a)}$$

$$\text{MAX} = \frac{1}{5}$$

$$\text{MIN} = \frac{1}{\text{MAX}} \text{ NEGATIVE (a)}$$

$$\text{MIN} = \frac{1}{-1} = -1$$

$$\text{MAX} = \frac{1}{5}, \text{ MIN} = -1$$