

Q1a

$$a) \quad \tan \theta = \frac{\sin \theta}{\cos \theta} \quad \operatorname{cosec} \theta = \frac{1}{\sin \theta}$$

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

$$\frac{1}{\cos \theta} = \sec \theta$$

$$\tan \theta \operatorname{cosec} \theta = \sec \theta$$

Q1b

$$b) \tan \theta \operatorname{cosec} \theta = \sec \theta$$

$$\sec \theta = \frac{1}{\cos \theta}$$

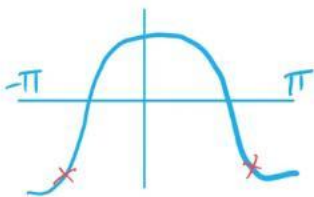
$$\frac{1}{\cos \theta} = \frac{-2\sqrt{3}}{3}$$

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

RATIONALISE

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

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



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

Q2

MULTIPLY FACTORISE SOLVE

$$2 - \operatorname{cosec}^2 \theta = \operatorname{cosec} \theta$$

$$\operatorname{cosec}^2 \theta + \operatorname{cosec} \theta - 2 = 0$$

$$(\operatorname{cosec} \theta + 2)(\operatorname{cosec} \theta - 1) = 0$$

$$\frac{1}{\sin \theta} + 2 = 0$$

$$\frac{1}{\sin \theta} - 1 = 0$$

$$\frac{1}{\sin \theta} = -2$$

$$\frac{1}{\sin \theta} = 1$$

$$\sin \theta = -\frac{1}{2}$$

$$\sin \theta = 1$$

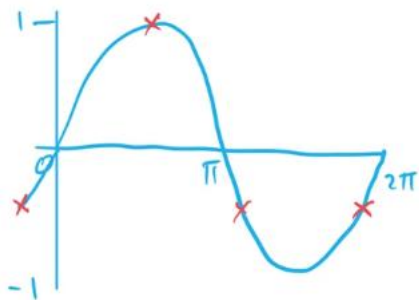
$$\sin^{-1}\left(-\frac{1}{2}\right) = -\frac{1}{6}\pi$$

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

$$\pi + \frac{1}{6}\pi = \frac{7}{6}\pi$$

$$2\pi - \frac{1}{6}\pi = \frac{11}{6}\pi$$

$$\theta = \frac{1}{2}\pi, \frac{7}{6}\pi, \frac{11}{6}\pi$$



$$-2\pi < 2x \leq 2\pi$$

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

[6]

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

$$\frac{2}{\sin 2x} - 75 = \frac{5}{\sin 2x}$$

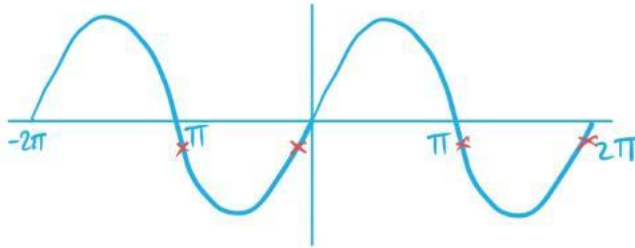
$$-75 = \frac{3}{\sin 2x}$$

$$\sin 2x = \frac{3}{-75} = -\frac{1}{25}$$

LET $Z = 2x$ TRANSFORM THE RANGE

$$\sin Z = -\frac{1}{25}$$

$$\sin^{-1}\left(-\frac{1}{25}\right) = -0.04001\dots$$



$$Z = -0.04, -3.10, 3.18, 6.24$$

$$\begin{matrix} \div 2 \\ \rightarrow \end{matrix} \quad \begin{matrix} -\pi + 0.04 & \pi + 0.04 & 2\pi - 0.04 \end{matrix}$$

$$x = -1.55, -0.020, 1.59, 3.12$$

(3sf)

Q4a

$$a) \quad 1 + \cot^2 x \equiv \operatorname{cosec}^2 x$$

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

$$2(\operatorname{cosec}^2 x - 1) = 1 - 5 \operatorname{cosec} x$$

$$2 \operatorname{cosec}^2 x - 2 = 1 - 5 \operatorname{cosec} x$$

$$2 \operatorname{cosec}^2 x + 5 \operatorname{cosec} x - 3 = 0$$

$$(2 \operatorname{cosec} x - 1)(\operatorname{cosec} x + 3) = 0$$

Q4b

b) $(2 \operatorname{cosec} x - 1)(\operatorname{cosec} x + 3) = 0$

$2 \operatorname{cosec} x - 1 = 0$

$\operatorname{cosec} x + 3 = 0$

$\operatorname{cosec} x = \frac{1}{2}$

$\operatorname{cosec} x = -3$

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

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

$\sin x = 2$

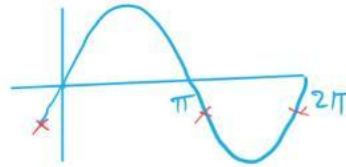
$\sin x = -\frac{1}{3}$

DOESNT EXIST

$\operatorname{cosec} \theta = k$ NO SOLUTIONS

$\sin^{-1}\left(-\frac{1}{3}\right) = -0.339\dots$

$-1 < k < 1$



$\pi + x$

$2\pi - x$

$3.4814\dots$

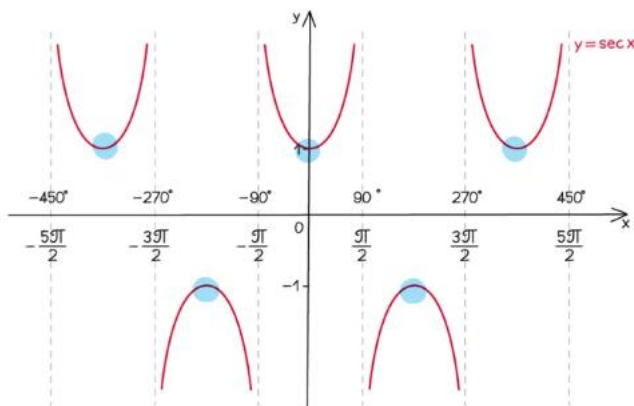
$5.9433\dots$

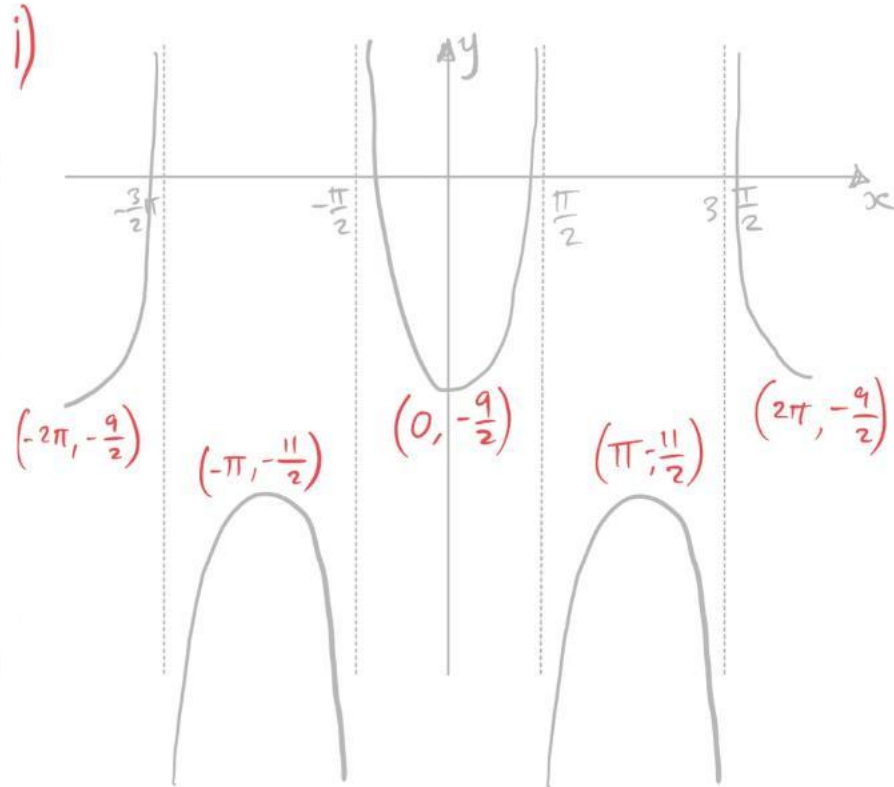
$x = 3.48, 5.94$ (3sf)

Q5

VERTICAL STRETCH SF $\frac{1}{2}$

TRANSLATION $\begin{pmatrix} 0 \\ -5 \end{pmatrix}$





ii) $-5.5 < k < -4.5$