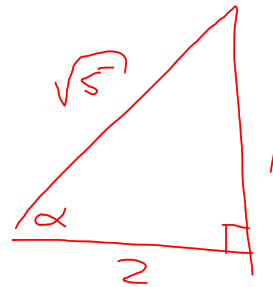


Se)

$$\begin{aligned}\frac{\tan \theta \tan \frac{\theta}{2}}{\tan \theta - \tan \frac{\theta}{2}} &= \frac{\frac{2t}{1-t^2} \times t}{\frac{2t}{1-t^2} - t} \\ &= \frac{2t^2}{2t - t(1-t^2)} \\ &= \frac{2t}{2 - 1 + t^2} \\ &= \frac{2t}{t^2 + 1} \\ &= \underline{\underline{\sin \theta}}\end{aligned}$$

$$\begin{aligned} & \Rightarrow 2 \cos x + \sin x \\ & = \sqrt{5} \cos\left(x - \tan^{-1} \frac{1}{2}\right) \end{aligned}$$



$$8d) \quad \tan \alpha = -\frac{1}{3}$$
$$\frac{\pi}{2} < \alpha < \pi \quad (\alpha_2) \quad \Rightarrow \quad \frac{\pi}{4} < \frac{\alpha}{2} < \frac{\pi}{2} \quad (\alpha_1)$$

$$\text{let } t = \tan \frac{\alpha}{2}$$

$$\tan \alpha = \frac{2 \tan \frac{\alpha}{2}}{1 - \tan^2 \frac{\alpha}{2}}$$

$$-\frac{1}{3} = \frac{2t}{1-t^2}$$

$$t^2 - 1 = 6t$$

$$t^2 - 6t - 1 = 0$$

$$t = \frac{6 \pm \sqrt{40}}{2}$$

$$\therefore \tan \frac{\alpha}{2} = \frac{6 + \sqrt{40}}{2}, \quad t > 0$$
$$= \frac{3 + \sqrt{10}}{1}$$

$$1b) \quad 6 \sin x - 5 \cos x = 7$$

$$\sqrt{61} \sin(x - \alpha) = 7$$

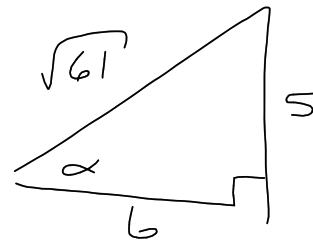
$$\sin(x - \alpha) = \frac{7}{\sqrt{61}}$$

$$\sin \beta = \frac{7}{\sqrt{61}}$$

$$\beta = 63^\circ 40'$$

$$x - 39^\circ 48' = 63^\circ 40', 116^\circ 20'$$

$$x = 103^\circ 28', 156^\circ 08'$$



$$\tan \alpha = \frac{5}{6}$$

$$\alpha = 39^\circ 48'$$

$$\text{lod, } 9 \cos x + 7 \sin x = 3$$

$$\sqrt{130} \cos(x - \alpha) = 3$$

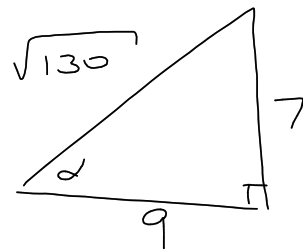
$$\cos(x - \alpha) = \frac{3}{\sqrt{130}}$$

$$\cos \beta = \frac{3}{\sqrt{130}}$$

$$\beta = 74^\circ 45'$$

$$x - 37^\circ 52' = 74^\circ 45', 285^\circ 15'$$

$$x = 112^\circ 37', 323^\circ 7'$$



$$\tan \alpha = \frac{7}{9}$$

$$\alpha = 37^\circ 52'$$

$$11a) \quad \cos x - \sin x = 1$$

$$\frac{1-t^2}{1+t^2} - \frac{2t}{1+t^2} = 1$$

$$1-t^2 - 2t = 1+t^2$$

$$2t^2 + 2t = 0$$

$$t^2 + t = 0$$

$$t(t+1) = 0$$

$$\tan \frac{x}{2} = 0 \quad \text{or} \quad \tan \frac{x}{2} = -1$$

$$\frac{x}{2} = 0, 180^\circ \quad \frac{x}{2} = 135^\circ$$

$$\underline{x = 0^\circ, 360^\circ, 270^\circ}$$

$$0 \leq x \leq 360^\circ$$

$$0 \leq \frac{x}{2} \leq 180^\circ$$

$$13b) \quad 4 \cos x + \sin x = 1$$

$$0 \leq x \leq 360$$

$$0 \leq \frac{x}{2} \leq 180$$

$$(5t + 3)(t - 1) = 0$$

$$t = -\frac{3}{5} \quad \text{or} \quad t = 1$$

$$\tan \frac{x}{2} = -\frac{3}{5} \quad \tan \frac{x}{2} = 1$$

Q2

$$14a) \quad 3\sin x - 2\cos x = 2$$

$$\frac{6t}{1+t^2} - \frac{2-2t^2}{1+t^2} = 2$$

$$6t - 2 + 2t^2 = 2 + 2t^2$$

$$6t - 4 = 0$$

$$3t - 2 = 0$$

$$20a) \quad 2\cos x - \sin x \quad \textcircled{R\sin(x+\alpha)}$$

$$= \sqrt{5} \sin(\alpha - x)$$

$$= \sqrt{5} \sin(180 - \alpha + x)$$

$$= \sqrt{5} \sin(x + 116^\circ 34')$$

$$\text{iii) } 2\cos x - \sin x = 1$$

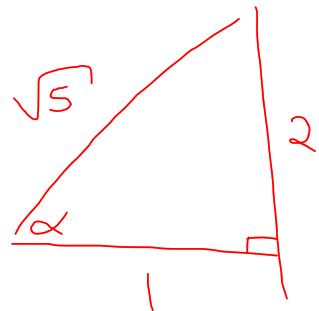
$$\sin(x + 116^\circ 34') = \frac{1}{\sqrt{5}}$$

α_1, α_2

$$x + 116^\circ 34' = 26^\circ 34', 153^\circ 26'$$

$$x = -90^\circ, 36^\circ 52'$$

$$x = 36^\circ 52', 270^\circ$$



$$\tan \alpha = 2$$

$$\alpha = 63^\circ 26'$$

20b) (u)

$$-3\sin x - 4\cos x = 2$$

$$4\cos x + 3\sin x = -2$$

$$5\cos(x - \alpha) = -2$$

$$\cos(x - \alpha) = -\frac{2}{5}$$

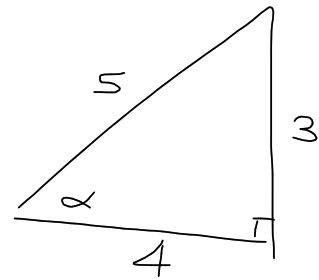
Q2,3

$$\cos \beta = \frac{2}{5}$$

$$\beta = 66^\circ 25'$$

$$x - 36^\circ 52' = 113^\circ 35', 246^\circ 25'$$

$$x = 150^\circ 27', 283^\circ 17'$$

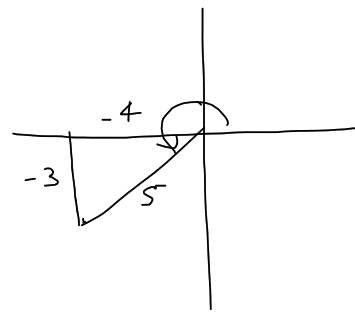


$$\tan \alpha = \frac{3}{4}$$

$$\alpha = 36^\circ 52'$$

$$-3\sin x - 4\cos x = 2$$

$$5\cos(x - 216^\circ 52') = 2$$



23/

a) $2\sec x - 2\tan x = 5$

$$0^\circ \leq x \leq 360^\circ$$

$$\frac{2+2t^2}{1-t^2} - \frac{4t}{1-t^2} = 5$$

$$2+2t^2-4t = 5-5t^2$$

$$7t^2-4t-3=0$$

$$23a) \quad 2\sec x - 2\tan x = 5$$

$$2 - 2\sin x = 5\cos x$$

$$2\sin x + 5\cos x = 2$$

$$\sqrt{29} \cos(x - 21^\circ 48') = 2$$

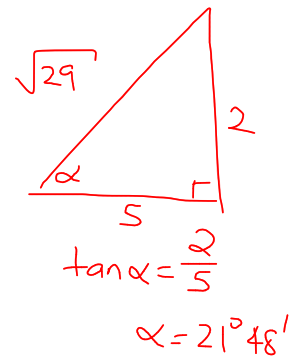
$$\cos(x - 21^\circ 48') = \frac{2}{\sqrt{29}}$$

Q1,4

$$x - 21^\circ 48' = 68^\circ 12', 291^\circ 48'$$

$$x = 90^\circ, 313^\circ 36'$$

$$\therefore \underline{x = 313^\circ 36'} \quad (\tan 90^\circ \text{ undefined})$$



$$23b) 2 \operatorname{cosec} x + 5 \cot x = 3$$

$$2 + 5 \cos x = 3 \sin x$$

$$2 + 5 \left(\frac{1-t^2}{1+t^2} \right) = 3 \left(\frac{2t}{1+t^2} \right)$$

$$2 + 2t^2 + 5 - 5t^2 = 6t$$

$$3t^2 + 6t - 7 = 0$$

$$t = \frac{-6 \pm \sqrt{120}}{6}$$

$$= \frac{-6 \pm 2\sqrt{30}}{6}$$

$$= \frac{-3 \pm \sqrt{30}}{3}$$

$$t = \tan \frac{x}{2}$$

$$\tan \frac{x}{2} = \frac{-3 - \sqrt{30}}{2} \quad \text{or} \quad \tan \frac{x}{2} = \frac{-3 + \sqrt{30}}{2}$$

$$\frac{x}{2} = 109^\circ 29'$$

$$\frac{x}{2} = 39^\circ 33'$$

$$x = 218^\circ 58'$$

$$x = 79^\circ 6'$$

$$x = \underline{\underline{79^\circ 6', 218^\circ 58'}}$$

