

Ex 1.7

(i)

$$x + 2y + 4 = 0$$
$$m_1 = -1/2$$

$$x - 3y + 2 = 0$$
$$m_2 = -1/-3 = 1/3$$

$$\tan \theta = \frac{-1/2 - 1/3}{1 + (-1/2)(1/3)} = \frac{-3-2}{6} = \frac{-5/6}{1-1/6} = \frac{-5/6}{5/6} = -1$$

$$\tan \theta = -1$$

(ii)

$$2x + 3y - 1 = 0$$
$$m_1 = -2/3$$

$$x - 2y + 3 = 0$$
$$m_2 = -1/-2 = 1/2$$

$$\tan \theta = \frac{-2/3 - 1/2}{1 + (-2/3)(1/2)} = \frac{-4-3}{6} = \frac{-7/6}{1-2/6} = \frac{-7/6}{4/6} = \frac{-7/6 \times 6}{4} =$$

$$\tan \theta = 7/4$$

(iii)

$$2x + y - 6 = 0$$
$$m = -2/1 = -2$$

$$2x - 3y + 5 = 0$$
$$m = -2/-3 = 2/3$$

$$\tan \theta = \frac{-2 - 2/3}{1 + (-2)(2/3)} = \frac{-6-2}{3} = \frac{-8/3}{1-4/3} = \frac{-8/3}{-1/3} = \frac{-8 \times 3}{3 \times -1}$$

$$\tan \theta = 8$$

Q2
acute

$$y = 2x + 5$$
$$m_1 = 2$$

$$3x + y = 7$$
$$m_2 = -3$$

$$\tan \theta = \frac{2+3}{1+(2)(-3)} = \frac{5}{-5} = -1$$

$$\tan \theta = -1$$

$$\theta = \tan^{-1}(-1)$$

$$\theta = -45^\circ$$

$$\theta = 45^\circ$$

Q3
obtuse

$$x - 2y - 1 = 0$$
$$m_1 = -\frac{1}{2} = \frac{1}{2}$$

$$3x - y + 2 = 0$$
$$m_2 = -\frac{3}{-1} = 3$$

$$\tan \theta = \frac{\frac{1}{2} - 3}{1 + (\frac{1}{2})(3)} = \frac{-2\frac{1}{2}}{2\frac{1}{2}} = -1$$

$$\tan \theta = -1$$

$$\theta = 45^\circ$$

$$\therefore \text{obtuse angle} = 135^\circ$$

Q4
acute

$$x - 3y + 4 = 0$$
$$m_1 = -\frac{1}{3} = \frac{1}{3}$$

$$2x + y - 5 = 0$$
$$m_2 = -\frac{2}{1} = -2$$

$$\tan \theta = \frac{\frac{1}{3} - (-2)}{1 + (\frac{1}{3})(-2)} = \frac{2\frac{1}{3}}{\frac{1}{3}} = \frac{7}{3} \times \frac{3}{1} = 7$$

$$\tan \theta = 7$$

$$\theta = \tan^{-1} 7$$

$$\theta = 82^\circ \text{ To nearest degree}$$

Q5
obtuse

$$x - 2y + 7 = 0$$

$$m_1 = -\frac{1}{2} = \frac{1}{2}$$

$$3x - y + 2 = 0$$

$$m_2 = -\frac{3}{-1} = 3$$

$$\tan \theta = \frac{\frac{1}{2} - 3}{1 + (\frac{1}{2})(3)} = \frac{-2\frac{1}{2}}{2\frac{1}{2}} = -1$$

$$\tan \theta = -1$$

$$\theta = 45^\circ$$

$$\therefore \text{obtuse angle} = 135^\circ$$

Q6
acute

$$x - \sqrt{3}y + 4 = 0$$

$$m_1 = -\frac{1}{\sqrt{3}} = \frac{1}{\sqrt{3}}$$

$$\sqrt{3}x - y - 7 = 0$$

$$m_2 = \frac{-\sqrt{3}}{-1} = \sqrt{3}$$

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

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

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

$$\theta = 30^\circ$$

$$\theta = 30^\circ$$

Q7 Slopes 45° to $2x - 3y + 1 = 0$
 $m_1 = -2/3 = 2/3$

$$\tan 45 = \frac{2/3 - m_2}{1 + (2/3)m_2} \quad (\times 3)$$

$$1 = \pm \frac{2 - 3m_2}{3 + 2m_2}$$

$$3 + 2m_2 = \pm (2 - 3m_2)$$

$$\begin{aligned} 3 + 2m_2 &= 2 - 3m_2 \\ 5m_2 &= -1 \\ m_2 &= \underline{-1/5} \end{aligned}$$

$$\begin{aligned} 3 + 2m_2 &= -2 + 3m_2 \\ 5 &= m_2 \end{aligned}$$

Q8 eqns thro $(0,0)$, 45° with $2x + 3y - 4 = 0$
 $m_1 = -2/3$

$$\tan 45 = \pm \frac{-2/3 - m_2}{1 + (-2/3)m_2} \quad (\times 3)$$

$$1 = \pm \frac{-2 - 3m_2}{3 - 2m_2}$$

$$3 - 2m_2 = \pm (-2 - 3m_2)$$

$$\begin{aligned} 3 - 2m_2 &= -2 - 3m_2 \\ m_2 &= -5 \end{aligned}$$

$$\begin{aligned} y - 0 &= -5(x - 0) \\ y &= -5x \\ \underline{5x + y} &= \underline{0} \end{aligned}$$

$$\begin{aligned} 3 - 2m &= 2 + 3m \\ 1 &= 5m \\ 1/5 &= m \end{aligned}$$

$$\begin{aligned} y - 0 &= 1/5(x - 0) \\ 5y &= x \\ \underline{x - 5y} &= \underline{0} \end{aligned}$$

• Q9 $(-1, 1)$ 45° with $2x + y - 2 = 0$ 110
 $m_1 = -2$

$$\tan 45 = \pm \frac{-2 - m_2}{1 + (-2)(m_2)}$$

$$1 = \pm \frac{-2 - m_2}{1 - 2m_2}$$

$$1 - 2m_2 = \pm (-2 - m_2)$$

$$\begin{aligned} 1 - 2m_2 &= -2 - m_2 \\ 3 &= m_2 \end{aligned}$$

$$\begin{aligned} 1 - 2m_2 &= 2 + m_2 \\ -1 &= 3m_2 \\ -\frac{1}{3} &= m_2 \end{aligned}$$

$$\begin{aligned} y - 1 &= 3(x + 1) \\ y - 1 &= 3x + 3 \\ \underline{3x - y + 4 = 0} \end{aligned}$$

$$\begin{aligned} y - 1 &= -\frac{1}{3}(x + 1) \\ 3y - 3 &= -x - 1 \\ \underline{x + 3y - 2 = 0} \end{aligned}$$

• Q10 $(4, 2)$ $\tan^{-1}(\frac{2}{3})$ $x + y - 2 = 0$
 $m_1 = -1$

$$\tan\left(\tan^{-1}\frac{2}{3}\right) = \pm \frac{-1 - m}{1 + (-1)(m)} = \pm \frac{-1 - m}{1 - m}$$

$$\frac{2}{3} = \pm \left(\frac{-1 - m}{1 - m}\right)$$

$$2 - 2m = \pm (-3 - 3m)$$

$$\begin{aligned} 2 - 2m &= -3 - 3m \\ m &= -5 \end{aligned}$$

$$\begin{aligned} 2 - 2m &= 3 + 3m \\ -1 &= 5m \\ -\frac{1}{5} &= m \end{aligned}$$

$$\begin{aligned} y - 2 &= -5(x - 4) \\ y - 2 &= -5x + 20 \\ \underline{5x + y - 22 = 0} \end{aligned}$$

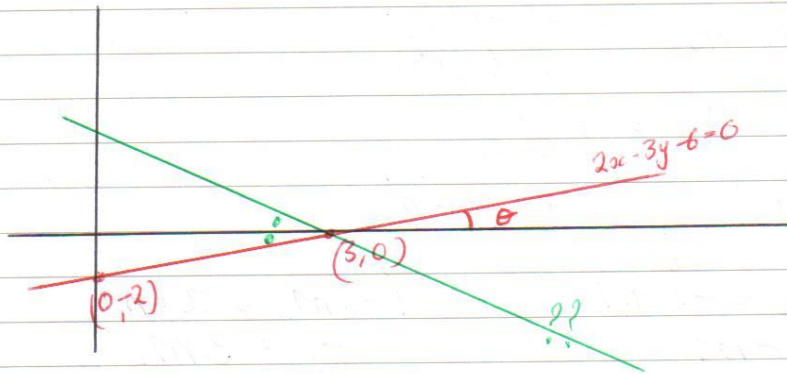
$$\begin{aligned} y - 2 &= -\frac{1}{5}(x - 4) \\ 5y - 10 &= -x + 4 \\ \underline{x + 5y - 14 = 0} \end{aligned}$$

Q11

$$2x - 3y - 6 = 0$$

$$m = -\frac{2}{3} = \frac{2}{3}$$

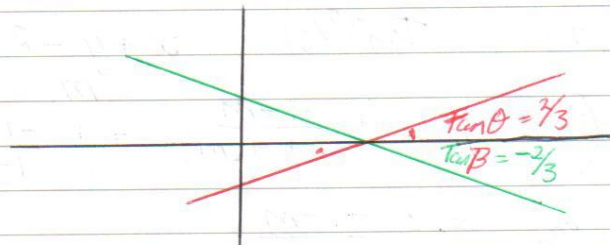
$$(0, -2) \quad (3, 0)$$



Slope of (red) line is $\frac{2}{3}$.

\Rightarrow Tan of the angle this line makes with the x axis is $\frac{2}{3}$. $\tan \theta = \frac{2}{3}$

The new line (green) has a slope ?



Since x axis bisects the angle
 $\Rightarrow \tan \beta$ is also $\frac{2}{3}$
but in opposite direction $\Rightarrow -\frac{2}{3}$

\Rightarrow Eqn of (green) line $m = -\frac{2}{3}$ and pt $(3, 0)$

$$y - 0 = -\frac{2}{3}(x - 3)$$

$$3y = -2x + 6$$

$$2x + 3y - 6 = 0$$

Q12
(i) $L: tx + y - 7 = 0$
 $m_1 = -\frac{t}{1} = -t$

(ii) $y = 2x + 5$
 $m = 2$

Angle is 45°

$$\tan 45 = \pm \frac{-t-2}{1+(-t)(2)}$$

$$1 = \pm \frac{-t-2}{1-2t}$$

$$1-2t = \pm (-t-2)$$

↙
 $1-2t = -t-2$
 $3 = t$

↘
 $1-2t = t+2$
 $-1 = 3t$
 $-\frac{1}{3} = t$