

Question 4

(25 marks)

(a) Solve the simultaneous equations:

$$\begin{aligned} 2x + 8y - 3z &= -1 & \textcircled{1} \\ 2x - 3y + 2z &= 2 & \textcircled{2} \\ 2x + y + z &= 5 & \textcircled{3} \end{aligned}$$

$$\begin{aligned} \textcircled{1} &\Rightarrow 2x + 8y - 3z = -1 \\ -\textcircled{2} &\Rightarrow \underline{-2x + 3y - 2z = -2} \\ &11y - 5z = -3 & \textcircled{4} \end{aligned}$$

$$\begin{aligned} \textcircled{2} &\Rightarrow 2x - 3y + 2z = 2 \\ -\textcircled{3} &\Rightarrow \underline{-2x - y - z = -5} \\ &-4y + z = -3 & \textcircled{5} \end{aligned}$$

$$\begin{aligned} \textcircled{4} &\Rightarrow 11y - 5z = -3 \\ 5 \times \textcircled{5} &\Rightarrow \underline{-20y + 5z = -15} \\ &-9y = -18 \\ &\boxed{y = 2} \end{aligned}$$

Sub in $\textcircled{5}$

$$-4(2) + z = -3$$

$$\boxed{z = 5}$$

Sub in $\textcircled{1}$

$$2x + 8(2) - 3(5) = -1$$

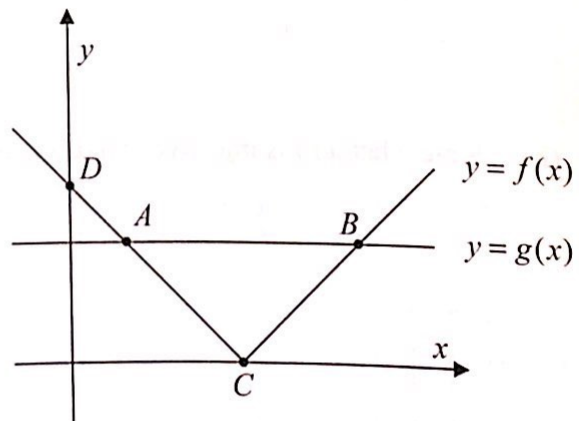
$$\boxed{x = -1}$$

(b) The graphs of the functions $f: x \mapsto |x-3|$ and $g: x \mapsto 2$ are shown in the diagram.

(i) Find the co-ordinates of the points A, B, C and D.

$$\begin{aligned} |x-3| &= 2 \\ \therefore x-3 &= 2 \quad \text{or} \quad x-3 = -2 \\ x &= 5 \quad \text{or} \quad x = 1 \end{aligned}$$

$$\begin{aligned} A &= (1, 2) & B &= (5, 2) \\ C &= (3, 0) & D &= (0, 3) \end{aligned}$$



(ii) Hence, or otherwise, solve the inequality $|x-3| < 2$.

$$\boxed{1 < x < 5}$$