

Answer all six questions from this section.

## Question 1

(25 marks)

(a) Solve the simultaneous equations.

$$2x + 3y - z = -4 \quad (1)$$

$$3x + 2y + 2z = 14 \quad (2)$$

$$x - 3z = -13 \quad (3)$$

$$\begin{array}{l} -2 \times (1) \Rightarrow -4x - 6y + 2z = 8 \\ 3 \times (2) \Rightarrow 9x + 6y + 6z = 42 \end{array}$$

$$\hline 5x + 8z = 50$$

$$-5 \times (3) \Rightarrow -5x + 15z = 65$$

$$23z = 115$$

$$\boxed{z = 5}$$

Sub in (3)

$$x - 3(5) = -13$$

$$\boxed{x = 2}$$

Sub in (1)

$$2(2) + 3y - 5 = -4$$

$$4 + 3y - 5 = -4$$

$$3y = -3$$

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

(b) Solve the inequality  $\frac{2x-3}{x+2} \geq 3$ , where  $x \in \mathbb{R}$  and  $x \neq -2$ .

$$(x+2)^2 \left( \frac{2x-3}{x+2} \right) \geq 3(x+2)^2$$

$$2x^2 - 3x + 4x - 6 \geq 3x^2 + 12x + 12$$

$$0 \geq x^2 + 11x + 18$$

$$\text{let } 0 = x^2 + 11x + 18$$

$$0 = (x+2)(x+9)$$

$$x = -2 \text{ or } x = -9$$

$$\begin{array}{c} \hline -9 \qquad -2 \qquad 0 \\ \hline \end{array}$$

X

✓

$$0 \geq 0 + 0 + 18$$

X

3

$$\dots \boxed{-9 \leq x \leq -2}$$