

## LC 2018: PAPER 1

### QUESTION 1 (25 MARKS)

#### Question 1 (a)

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

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

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

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

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

$$-6x - 9y + 3z = 12$$

$$x - 3z = -13$$

$$\underline{-5x - 9y} = -1 \dots (4)$$

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

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

$$4x + 6y - 2z = -8$$

$$\underline{3x + 2y + 2z = 14}$$

$$7x + 8y = 6 \dots (5)$$

$$-5x - 9y = -1 \dots (4) \times (7)$$

$$7x + 8y = 6 \dots (5) \times (5)$$

$$-35x - 63y = -7$$

$$\underline{35x + 40y = 30}$$

$$-23y = 23 \Rightarrow y = -1$$

Into (5):  $7x + 8(-1) = 6 \Rightarrow x = 2$

Into (3):  $(2) - 3z = -13 \Rightarrow z = 5$

ANSWER:  $(x, y, z) = (2, -1, 5)$

#### MARKING SCHEME NOTES

##### Question 1 (a) [Scale 15D (0, 5, 7, 11, 15)]

5: • Matches coefficient of 1 variable in 2 equations

• Writes  $x$  in terms of  $z$

7: • 1 unknown found with errors

• Eliminates one unknown

• 1 unknown found and stops

11: • 2 unknowns found

#### Question 1 (b)

$$\frac{2x-3}{x+2} \geq 3, x \in \mathbb{R}, x \neq -2$$

Multiply both sides by  $(x+2)^2$ :  $(2x-3)(x+2) \geq 3(x+2)^2$

$$(2x-3)(x+2) - 3(x+2)^2 \geq 0$$

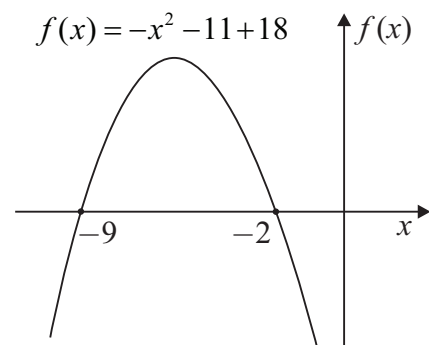
$$(x+2)[(2x-3) - 3(x+2)] \geq 0$$

$$\boxed{(x+2)(-x-9) \geq 0} \dots \text{Test box}$$

Solve  $(x+2)(-x-9) = 0 \Rightarrow x = -9, -2$

Region test:

←	$\boxed{-9}$	↔	$\boxed{-2}$	→
$(x+2)(-x-9) \geq 0$	$(x+2)(-x-9) \geq 0$	$(x+2)(-x-9) \geq 0$		
$-10: (-8)(1) \geq 0$	$-3: (-1)(-6) \geq 0$	$-1: (1)(-8) \geq 0$		
$-8 \geq 0$ [False]	$6 \geq 0$ [True]	$-8 \geq 0$ [False]		
	↓			
	$-9 \leq x < -2$			



ANSWER:  $-9 \leq x < -2, x \in \mathbb{R}, x \neq -2$

**MARKING SCHEME NOTES**

**Question 1 (b) [Scale 10D (0, 3, 5, 8, 10)]**

**3:** • Use of  $(x + 2)^2$

• Relevant work but with linear inequality

• Squares both sides with some subsequent work (low partial credit at most)

**5:** • Quadratic inequality involving 0

**8:** • Roots of quadratic found

**Note:** Accept  $-9 \leq x \leq -2$

---