1. $2x+3y=9$ **(1)**

$6y-x=3$ **(2)**

(1)$\times 2$: $2(2x+3y)=2\times 9$

$\therefore 4x+6y=18$ **(3)** **M1**

(3) – (2): $4x+6y-(6y-x)=18-3$ **M1**

$\therefore 5x=15 \therefore x=3$ **A1**

Substitute $x=3$ into **(2)**:

$6y-3=3 \therefore 6y=6 \therefore y=1$ **A1**

Technique: Multiply the second equation by 2, and then subtract the first equation to eliminate *y*. Then solve for *x* and substitute this value in to find *y*.

Alternative Method: Rearrange the second equation to make *x* the subject, then substitute this for *x* in the first equation to find *y*.

[4 Marks]

2. $x+y=6$ **(1)**

$x^2-2x+y=4$ **(2)**

$\therefore y=6-x$ (by **(1)**)

Substitute rearranged version of (1) into (2):

$x^2-2x+(6-x)=4$

$x^2-3x+6=4$

$x^2-3x+2=0$ **M1**

$(x-2)(x-1)=0$

$\therefore x=2$ or $x=1$ **A1**

Substitute $x=2$ into **(1)**: $2+y=6 \therefore y=4$

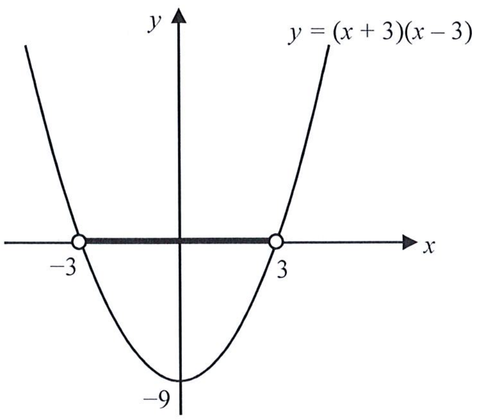
Substitute $x=1$ into **(1)**: $1+y=6 \therefore y=5$ **M1**

$\therefore$ solutions are $x=2, y=4$ or $x=1, y=5$ **A1A1**

Alternative Technique: In this special case you could also subtract the first equation from the second to eliminate *y*, and then solve for *x*. Then substitute these values in to find corresponding values of *y*.

[5 Marks]

3. a) $x^2-9<0 \therefore (x+3)(x-3)<0$ **M1**



Technique: Factorise the equation, then sketch the graph and see for which values of *x* the function lies below the *x*-axis. A similar technique can be used for part b) and question 7.

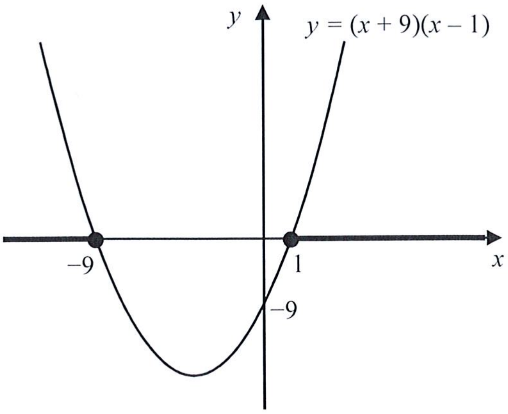
M1

The inequality is satisfied where the graph is strictly below the *x*-axis. **M1**

(Also accept any other method, e.g. solving the quadratic equation $(x+3)(x-3)=0$ (**M1**) and then testing values above and below the solutions (**M1**).)

$\therefore -3<x<3$ (for OCR also accept $x\in(-3,3)$) **A1**

b) $x^2+6x+11 \geq 20-2x \therefore x^2+8x-9 \geq 0 \therefore (x+9)(x-1) \geq 0$ **M1**



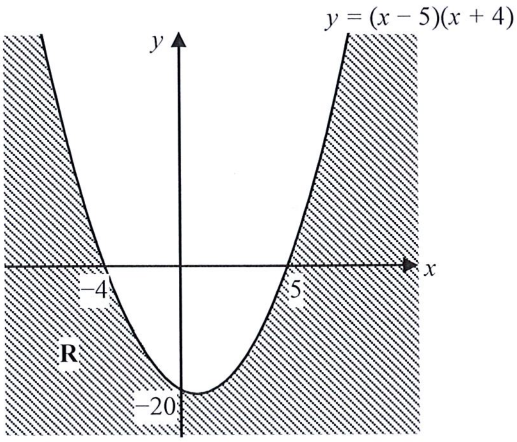
M1

The inequality is satisfied where the graph is on or above the x-axis. **M1**

(Also accept any other method, e.g. solving the quadratic equation $(x+9)(x-1)=0$ (**M1**) and then testing values above and below the solutions (**M1**).)

$\therefore x \leq -9$ or $x \geq 1$ (for OCR also accept $x \in (-\infty,-9] \cup [1,\infty)$) **A1** **[8 Marks]**

4. a) b) $y \leq x^2-x-20 \therefore y \leq (x-5)(x+4)$ **M1**



A3A1 **[5 Marks]**

5. $x-y+5=0$ **(1)**

$2x^2-xy-2x=-10$ **(2)**

$\therefore y=x+5$ (by **(1)**)

Substitute $y=x+5$ into **(2)**:

$2x^2-x(x+5)-2x=-10$ **M1**

$2x^2-x^2-5x-2x=-10$

$x^2-7x+10=0$ **M1**

$(x-2)(x-5)=0$

$\therefore x=2$ or $x=5$ **A1**

Substitute $x=2$ into **(1)**: $2-y+5=0 \therefore 7-y=0 \therefore y=7$

Substitute $x=5$ into **(1)**: $5-y+5=0 \therefore y=10$ **M1**

$\therefore$ solutions are $x=2, y=7$ or $x=5, y=10$ **A1A1** **[6 Marks]**

> **Technique:** Substitute the linear equation into the quadratic one to eliminate y, and then solve for x. Then substitute these values in to find corresponding values of y. A similar technique can be used for question 6.

6. $2x - y = 1$ **(1)**

$y^2 = x^2 + 4x - 3$ **(2)**

$\therefore y = 2x - 1$ (by **(1)**)

Substitute $y = 2x - 1$ into **(2)**:

$(2x-1)^2 = x^2 + 4x - 3$ **M1**

$4x^2 - 4x + 1 = x^2 + 4x - 3$

$3x^2 - 8x + 4 = 0$ **M1**

$(3x-2)(x-2) = 0$

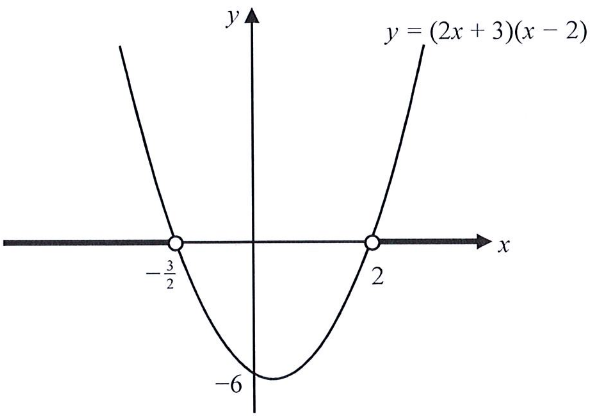
$\therefore x = \frac{2}{3}$ or $x = 2$ **A1**

Substitute $x = \frac{2}{3}$ into **(1)**: $2 \times \frac{2}{3} - y = 1 \therefore \frac{4}{3} - y = 1 \therefore y = \frac{1}{3}$

Substitute $x = 2$ into **(1)**: $2 \times 2 - y = 1 \therefore 4 - y = 1 \therefore y = 3$ **M1**

$\therefore$ solutions are $x = \frac{2}{3}, y = \frac{1}{3}$ or $x = 2, y = 3$ **A1A1** **[6 Marks]**

7. a) $2x^2 - x - 6 > 0 \therefore (2x+3)(x-2) > 0$ **M1**



M1

The inequality is satisfied where the graph is strictly above the x-axis. **M1**

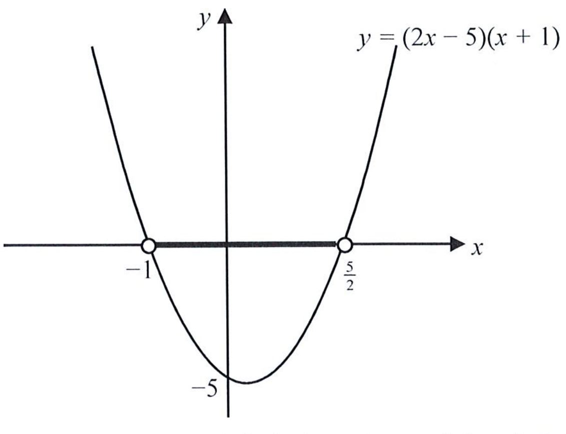
(Also accept any other method, e.g. solving the quadratic equation $(2x+3)(x-2) = 0$ (**M1**) and then testing values above and below the solutions (**M1**).)

$\therefore x < -\frac{3}{2}$ or $x > 2$ $\left(\text{for OCR also accept } x \in \left(-\infty, -\frac{3}{2}\right) \cup (2, \infty)\right)$ **A1**

b) $5x^2 + 2x - 3 < 3x^2 + 5x + 2$

$2x^2 - 3x - 5 < 0$

$(2x-5)(x+1) < 0$ **M1**



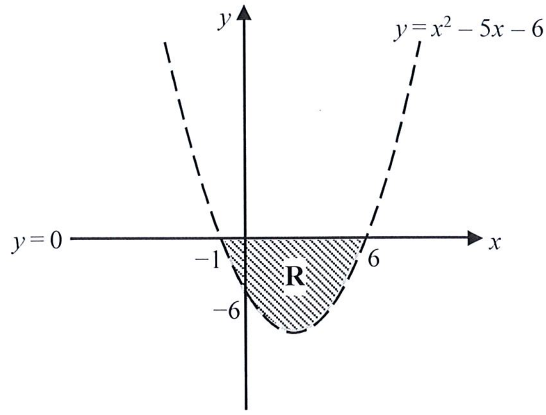
M1

The inequality is satisfied where the graph is strictly below the x-axis. **M1**

(Also accept any other method, e.g. solving the quadratic equation $(2x-5)(x+1) = 0$ (**M1**) and then testing values above and below the solutions (**M1**).)

$\therefore -1 < x < \frac{5}{2}$ $\left(\text{for OCR also accept } x \in \left(-1, \frac{5}{2}\right)\right)$ **A1** **[8 Marks]**

8. a) $y > x^2 - 5x - 6 \therefore y > (x-6)(x+1)$ and $y \le 0$ **M1**



A5

b) The line $y = x^2 - 5x - 6$ meets the line $y = 0$ at $x = -1$ and $x = 6$

The inequality is satisfied where the curve $y = x^2 - 5x - 6$ is strictly below the line $y = 0$ **M1**

So we can see from the graph that $-1 < x < 6$ (for OCR also accept $x \in (-1, 6)$) **A1** **[8 Marks]**

TOTAL 50 MARKS