

1. Solve the simultaneous equations

$$x^2 + y^2 = 29 \quad \textcircled{1}$$

$$y - x = 3$$

sub  $y = 3 + x$  into  $\textcircled{1}$

$$x^2 + (3 + x)^2 = 29$$

$$x^2 + 9 + 3x + 3x + x^2 = 29$$

$$2x^2 + 6x - 20 = 0$$

$$x^2 + 3x - 10 = 0$$

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

$$x = -5 \quad x = 2$$

$$y = 3 + (-5) \quad y = 3 + (2)$$

$$= -2$$

$$= 5$$

$$x = -5 \text{ and } y = -2 \text{ or } x = 2 \text{ and } y = 5$$

(Total 7 marks)

2. Bill said that the line  $y = 6$  cuts the curve  $x^2 + y^2 = 25$  at two points.

(a) By eliminating  $y$  show that Bill is incorrect.

$$\begin{aligned} x^2 + (6)^2 &= 25 \\ x^2 + 36 &= 25 \\ x^2 &= -9 \end{aligned}$$

There are no solutions. (You can not square root a negative number) (2)

(b) By eliminating  $y$ , find the solutions to the simultaneous equations

$$x^2 + y^2 = 25$$

$$y = 2x - 2$$

$$x^2 + (2x - 2)^2 = 25$$

$$x^2 + 4x^2 - 4x - 4x + 4 = 25$$

$$5x^2 - 8x - 21 = 0$$

$$(5x + 7)(x - 3) = 0$$

$$x = -\frac{7}{5} \quad x = 3$$

$$y = 2\left(-\frac{7}{5}\right) - 2 \quad y = 2(3) - 2$$

$$= -\frac{14}{5} - 2$$

$$y = 6 - 2$$

$$= 4$$

$$= -\frac{24}{5}$$

$$x = \dots\dots\dots -\frac{7}{5} \dots\dots\dots y = \dots\dots\dots -\frac{24}{5}$$

$$\text{or } x = \dots\dots\dots 3 \dots\dots\dots y = \dots\dots\dots 4 \dots\dots\dots$$

(6)

(Total 8 marks)

3. By eliminating  $y$ , find the solutions to the simultaneous equations

$$\begin{aligned}x^2 + y^2 &= 25 \\ y &= x - 7\end{aligned}$$

$$x^2 + (x - 7)^2 = 25$$

$$x^2 + x^2 - 7x - 7x + 49 = 25$$

$$2x^2 - 14x + 24 = 0$$

$$x^2 - 7x + 12 = 0$$

$$(x - 3)(x - 4) = 0$$

$$x = 3 \quad x = 4$$

$$\begin{aligned}y &= (3) - 7 \\ &= -4\end{aligned}$$

$$\begin{aligned}y &= (4) - 7 \\ &= -3\end{aligned}$$

$$\begin{aligned}x &= \dots\dots\dots 3 \dots\dots\dots y = \dots\dots\dots -4 \dots\dots\dots \\ \text{or } x &= \dots\dots\dots 4 \dots\dots\dots y = \dots\dots\dots -3 \dots\dots\dots\end{aligned}$$

(Total 6 marks)

4. By eliminating  $y$ , find the solutions to the simultaneous equations

$$y - 2x = 3 \quad y = 2x + 3$$

$$x^2 + y^2 = 18$$

$$x^2 + (2x + 3)^2 = 18$$

$$x^2 + 4x^2 + 6x + 6x + 9 = 18$$

$$5x^2 + 12x - 9 = 0$$

$$(5x - 3)(x + 3) = 0$$

$$x = \frac{3}{5} \quad x = -3$$

$$y = 2\left(\frac{3}{5}\right) + 3 \quad y = 2(-3) + 3$$

$$= \frac{6}{5} + 3$$

$$y = -6 + 3$$

$$= -3$$

$$= \frac{21}{5}$$

$$x = \frac{3}{5} \dots\dots\dots y = \frac{21}{5} \dots\dots\dots$$

$$\text{or } x = -3 \dots\dots\dots y = -3 \dots\dots\dots$$

(Total 7 marks)

5. Solve the simultaneous equations

$$x^2 + y^2 = 5$$

$$y = 3x + 1$$

$$x^2 + (3x + 1)^2 = 5$$

$$x^2 + 9x^2 + 6x + 1 = 5$$

$$10x^2 + 6x - 4 = 0$$

$$5x^2 + 3x - 2 = 0$$

$$(5x - 2)(x + 1) = 0$$

$$x = \frac{2}{5} \quad x = -1$$

$$y = 3\left(\frac{2}{5}\right) + 1 \quad y = 3(-1) + 1$$
$$= \frac{6}{5} + 1 \quad = -3 + 1$$
$$= \frac{11}{5} \quad = -2$$

$$x = \frac{2}{5} \quad y = \frac{11}{5}$$
$$\text{or } x = -1 \quad y = -2$$

(Total 6 marks)

6. Solve the simultaneous equations

$$x + y = 4 \quad y = 4 - x$$

$$x^2 + y^2 = 40$$

$$x^2 + (4 - x)^2 = 40$$

$$x^2 + 16 - 8x + x^2 = 40$$

$$2x^2 - 8x - 24 = 0$$

$$x^2 - 4x - 12 = 0$$

$$(x - 6)(x + 2) = 0$$

$$x = 6 \quad x = -2$$

$$y = -2 \quad y = 6$$

$$x = \dots 6 \dots, y = \dots -2 \dots$$

or

$$x = \dots -2 \dots, y = \dots 6 \dots$$

(Total 7 marks)

7. By eliminating  $x$ , find the solutions to the simultaneous equations

$$x - 2y = 1$$

$$x^2 + y^2 = 13$$

$$x = 2y + 1$$

$$(2y+1)^2 + y^2 = 13$$

$$4y^2 + 4y + 1 + y^2 = 13$$

$$5y^2 + 4y - 12 = 0$$

$$(5y - 6)(y + 2) = 0$$

$$y = \frac{6}{5} \quad y = -2$$

$$x = 2\left(\frac{6}{5}\right) + 1$$

$$= \frac{12}{5} + 1$$

$$= \frac{17}{5}$$

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

$$= -4 + 1$$

$$= -3$$

$$x = \frac{17}{5}, \quad y = \frac{6}{5}$$

$$\text{or } x = -3, \quad y = -2$$

(Total 7 marks)