



CHAPTER 4: SIMULTANEOUS EQUATIONS



Cloned SPM Question (2006, Paper 2)

Solve the simultaneous equations $2x + y = 3$ and $2x^2 + y^2 + xy = 12$. Give your answers correct to three decimal places.

Solution

$$2x + y = 3 \quad \dots\dots (1)$$

$$2x^2 + y^2 + xy = 12 \quad \dots\dots (2)$$

$$\text{From (1): } y = 3 - 2x \quad \dots\dots (3)$$

Substitute (3) into (2).

$$\begin{aligned} 2x^2 + (3 - 2x)^2 + x(3 - 2x) &= 12 \\ 2x^2 + 9 - 6x + 4x^2 + 3x - 2x^2 - 12 &= 0 \\ 4x^2 - 3x - 3 &= 0 \end{aligned}$$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(4)(-3)}}{2(4)}$$

$$= \frac{3 \pm \sqrt{9 + 48}}{8}$$

$$= \frac{3 \pm \sqrt{57}}{8}$$

$$= \frac{3 + \sqrt{57}}{8} \quad \text{or} \quad \frac{3 - \sqrt{57}}{8}$$

$$= 1.319 \quad \text{or} \quad -0.569$$

$$\text{From (3): } \begin{aligned} \text{When } x = 1.319, y &= 3 - 2(1.319) \\ &= 0.362 \end{aligned}$$

$$\begin{aligned} \text{When } x = -0.569, y &= 3 - 2(-0.569) \\ &= 4.138 \end{aligned}$$

Thus, the solutions are $x = 1.319, y = 0.362$ and $x = -0.569, y = 4.138$.

Pointers

- Identify the linear equation and make y the subject of the equation.
- Substitute y into the non-linear equation to obtain a quadratic equation in x .
- Use the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ to find the values of x .
- Substitute the values of x into the linear equation to obtain the corresponding values of y .