Cambridge International AS & A Level

Mathematics 9709

Paper 1 Pure Mathematics 1

Topic 1-Quadratics

Question No (4)

Question No (4)

The equation of a curve C is $y = 2x^2 - 8x + 9$ and the equation of a line L is $x + y = 3$.

(i) Find the x-coordinates of the points of intersection of L and C.

(ii) Show that one of these points is also the stationary point of C.

Solution

(i) Given equation of curve

$$y = 2x^2 - 8x + 9 \longrightarrow (1)$$

and equation of line

$$x + y = 3 \longrightarrow (2)$$

from (2)

$$y = 3 - x \longrightarrow (3)$$

put $y = 3 - x$ in (1)

$$3 - x = 2x^2 - 8x + 9$$

$$2x^2 - 8x + 9 - 3 + x = 0$$

$$2x^2 - 7x + 6 = 0$$

By factorization

$$2x^2 - 4x - 3x + 6 = 0$$

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

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

$$x - 2 = 0, \quad 2x - 3 = 0$$

$$x = 2, \quad 2x = 3$$

$$x = 2 \qquad x = 3/2$$

(ii) Equation of curve

$$y = 2x^2 - 8x + 9$$

Differentiate w.r.t x

$$\frac{dy}{dx} = 4x - 8$$

for stationary points

$$\frac{dy}{dx} = 0$$

$$\Rightarrow 4x - 8 = 0$$

$$4x = 8$$

$$x = 8/4$$

$$x = 2$$

put $x = 2$ in equation of curve

$$y = 2x^2 - 8x + 9$$

$$= 2(2)^2 - 8(2) + 9$$

$$= 2(4) - 16 + 9$$

$$= 8 - 16 + 9$$

$$y = 1$$

$P(2, 1)$

$\therefore P(2, 1)$ is also a stationary point of curve.