

SAMPLE PAPER 4: PAPER 1

QUESTION 5 (25 MARKS)

Question 5 (a)

$$f(x) = 3x^2 - 7x$$

$$f'(x) = 6x - 7$$

$$f'(3) = 6(3) - 7 = 18 - 7 = 11$$

Question 5 (b) (i)

$$y = ax^2 + bx$$

$$(3, 4) \in y = ax^2 + bx \Rightarrow 4 = a(3)^2 + b(3)$$

$$4 = 9a + 3b \dots (1)$$

$$y = ax^2 + bx$$

$$\frac{dy}{dx} = 2ax + b$$

$$\left(\frac{dy}{dx}\right)_{x=1} = 0 \Rightarrow 2a(1) + b = 0$$

$$2a + b = 0 \dots (2)$$

Solve equations (1) and (2) simultaneously to find a and b (see right).

$$a = \frac{4}{3}, b = -\frac{8}{3}$$

$$y = \frac{4}{3}x^2 - \frac{8}{3}x$$

$$9a + 3b = 4 \dots (1)$$

$$2a + b = 0 \dots (2) \times (-3)$$

$$9a + 3b = 4$$

$$-6a - 3b = 0$$

$$\frac{3a}{3a} = 4 \Rightarrow a = \frac{4}{3}$$

$$2a + b = 0 \dots (2)$$

$$2\left(\frac{4}{3}\right) + b = 0$$

$$\frac{8}{3} + b = 0$$

$$\therefore b = -\frac{8}{3}$$

Question 5 (b) (ii)

As the tangent is parallel to the x -axis, its slope is zero. Turning points are points whose tangents have zero slope.

Local minimum at $x = 1$

$$y = \frac{4}{3}x^2 - \frac{8}{3}x = \frac{4}{3}(1)^2 - \frac{8}{3}(1) = \frac{4}{3} - \frac{8}{3} = -\frac{4}{3}$$

Local minimum: $(1, -\frac{4}{3})$
