

Cambridge International AS & A Level

Mathematics

9709/12

Paper 1 Pure Mathematics 1

October/November 2024

Question No(3)

Question No (3)

The equation of a curve is $y = 2x^2 - 3$. Two points A and B with x-coordinates 2 and $(2+h)$ respectively lie on the curve.

- (a) Find and simplify an expression for the gradient of the chord AB in terms of h .
- (b) Explain how the gradient of the curve at the point A can be deduced from the answer to part (a), and state the value of this gradient.

Solution:

Formula for gradient from two points
 $A(x_1, y_1), B(x_2, y_2)$

$$\text{gradient} = \frac{y_2 - y_1}{x_2 - x_1}$$

Given equation of curve
 $y = 2x^2 - 3$
 At $x = 2$
 $y = 2(2)^2 - 3$
 $= 8 - 3$
 $y = 5$

(8)

 $A(2, 5)$ now at $x = 2 + h$

$$y = 2(2+h)^2 - 3$$

$$= 2(4 + 4h + h^2) - 3$$

$$= 8 + 8h + 2h^2 - 3$$

$$y = 2h^2 + 8h + 5$$

 $B(2+h, 2h^2 + 8h + 5)$

gradient of the chord AB

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{2h^2 + 8h + 5 - 5}{2 + h - 2}$$

$$= \frac{2h^2 + 8h}{h}$$

$$= \frac{2h(h+4)}{h}$$

$$m = 2(h+4)$$

(b) explain how the gradient of the curve at the point A can be deduced from the answer to part (a), and state the value of this gradient.

Solution

DATE :-

(9)

The gradient at A can be deduced by taking $h \rightarrow 0$

$$\text{AS } m = 2(h+4)$$

taking $h \rightarrow 0$

$$m = 2(0+4)$$

$$m = 8$$