

Differentiation

For AQA Level 2 Certificate in Further Mathematics (8365)

Name _____

Total marks: **32**

Answer **all** questions in the spaces provided. Show your working: marks are given for correct method. You may use a calculator.

1 Work out $\frac{dy}{dx}$ for each curve.

(a) $y = 4x^5 - 3x^2 + 8x - 9$

[2 marks]

$$\frac{dy}{dx} = \underline{\hspace{10cm}}$$

(b) $y = \frac{x^3}{6} - \frac{5}{2x^4}$

[2 marks]

$$\frac{dy}{dx} = \underline{\hspace{10cm}}$$

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

Work out $\frac{dy}{dx}$

[3 marks]

$$\frac{dy}{dx} = \underline{\hspace{10cm}}$$

3 $y = \frac{x^6 - 6x^3 + 10}{2x^3}$

Work out $\frac{dy}{dx}$

[3 marks]

$$\frac{dy}{dx} = \underline{\hspace{10cm}}$$

4 A curve has equation $y = x(3x - 5) + \frac{16}{x^2}$

Work out the gradient of the curve when $x = -2$

[3 marks]

Answer $\underline{\hspace{10cm}}$

5 A curve has equation $y = 2x^3 - 7x + \frac{3}{x}$

(a) Work out $\frac{d^2y}{dx^2}$

[2 marks]

$$\frac{d^2y}{dx^2} = \underline{\hspace{10cm}}$$

(b) Circle the rate of change of the gradient of the curve at the point where $x = -1$

[1 mark]

☐ -18

☐ -4

☐ 2

☐ 18

6 A curve has equation $y = kx^2 - \frac{6}{x}$ where k is a constant.
The gradient of the curve at the point where $x = -2$ is 9.5
Work out the value of k .

[3 marks]

$$k = \underline{\hspace{10cm}}$$

- 7 A curve has equation $y = 2x^3 + 3x^2 - 18x + 5$

Use calculus to find the x -coordinates of all the points on the curve where the rate of change of y with respect to x is 18

[4 marks]

Answer _____

- 8 A curve has equation $y = ax^2 + \frac{b}{x}$ where a and b are constants.

The point $(2, 10)$ lies on the curve.

The gradient of the curve at the point where $x = -1$ is -2

Work out the value of a and the value of b .

[5 marks]

$a =$ _____ $b =$ _____

9 $y = \frac{x^5 - 8x^2 + 4}{2x^2}$

Work out the value of $\frac{d^2y}{dx^2}$ when $x = -2$

[4 marks]

Answer _____