Differentiation

Question Paper

Course	Edexcel IGCSE Maths
Section	3. Sequences, Functions & Graphs
Topic	Differentiation
Difficulty	Medium

Time allowed: 70

Score: /52

Percentage: /100

Question 1a

Use differentiation to find $\frac{\mathrm{d}y}{\mathrm{d}x}$ for the following:

$y = x^4$

[1 mark]

Question 1b

$y = 2x^{-3}$

[1 mark]

Question 1c

$y = \frac{4}{x}$

[1 mark]

Question 2a

Use differentiation to find $\frac{\mathrm{d}y}{\mathrm{d}x}$ for the following:

$y = 4x^3 + 2x$

[1 mark]

Question 2b

$y = -5x^{-2}$

[1 mark]

Question 2c

$y = \frac{1}{3x}$

[1 mark]

Question 3a

Use differentiation to find $\frac{\mathrm{d}y}{\mathrm{d}x}$ for the following:

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

[1 mark]

Question 3b

$-\frac{5}{3x^4}$

[2 marks]

Question 3c

$\frac{2}{3}x^2 + \frac{1}{5}x - \frac{3}{2x}$

[2 marks]

Question 4a

For the curve with equation $y = 2x^2 - 6x - 11$:

find $\frac{\mathrm{d}y}{\mathrm{d}x}$

[2 marks]

Question 4b

Find the coordinates of the point on the curve where the gradient is 2.

[2 marks]

Question 5a

A curve has equation $y = x^3 + \frac{7}{2}x^2 - 2x + 9$

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$

[2 marks]

Question 5b

Find the gradient of the curve at the point where:

(i)

$x = -3$

[2]

(ii)

$x = \frac{2}{3}$

[2]

[4 marks]

Question 5c

What can you say about the tangents to the curves at these two points?

[1 mark]

Question 6a

A particle P passes the fixed point O whilst moving along a straight line.

The displacement of P, from O, at time t seconds is s metres where

$$s = 6t^3 - 12t^2 + 7t$$

Find expressions for the velocity, $v\ m/s$, and the acceleration, $a\ m/s^2$ of the particle at time t seconds.

[4 marks]

Question 6b

Find the time at which the acceleration is 3 m/s^2.

[2 marks]

Question 7a

The curve $\mathbf{C}$ has equation $y = 5x^3 - x^2 - 6x + 4$.

Find $\frac{\mathrm{d}y}{\mathrm{d}x}$.

$\frac{\mathrm{d}y}{\mathrm{d}x}$ = ...

[2 marks]

Question 7b

There are two points on the curve $\mathbf{C}$ at which the gradient of the curve is 2.

Find the x coordinate of each of these two points.
Show clear algebraic working.

[4 marks]

Question 8a

$y = x^3 - 6x^2 - 15x$.

Find $\frac{dy}{dx}$.

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

[2 marks]

Question 8b

The curve with equation $y = x^3 - 6x^2 - 15x$ has two stationary points.

Work out the coordinates of these two stationary points.

[4 marks]

Question 9a

The curve C has equation $y = \frac{1}{3}x^3 - 9x + 1$.

Find $\frac{dy}{dx}$.

[2 marks]

Question 9b

Find the range of values of x for which C has a negative gradient.

[3 marks]

Question 10

Calculate the gradient of $y = 24 + 5x - x^2$ at $x = -1.5$.

[3 marks]

Question 11a

Differentiate $6 + 4x - x^2$.

[2 marks]

Question 11b

Find the coordinates of the turning point of the graph of $y = 6 + 4x - x^2$.

(..... , ...)

[2 marks]