Lesson 5

GCSE Mathematics
Differentiation I

5.1 Homework (Consolidation)

Marks Available : 76

Question 1
Write down the exact value of each of the following:

(i) 8^2 **(ii)** $(-6)^3$ **(iii)** $\left(\frac{1}{2}\right)^5$

(iv) $100^{\frac{1}{2}}$ **(v)** $8^{\frac{1}{3}}$ **(vi)** $(-1)^{97}$

(vii) $\left(\frac{\pi}{2}\right)^0$ **(viii)** 0^{67} **(ix)** $\left(\frac{5}{9}\right)^2$

[9 marks]

Question 2
Consider the curve, $y = x^3 - x$
Write down the points on the curve that have the x part as given;

(i) (0, _____) **(ii)** (1, _____) **(iii)** (2, _____)

(iv) (4, _____) **(v)** (10, _____) **(vi)** (−10, _____)

[6 marks]

Question 3
Write down the exact value of the following:

(i) 3^{-2} **(ii)** $\sqrt{\left(\frac{16}{49}\right)}$

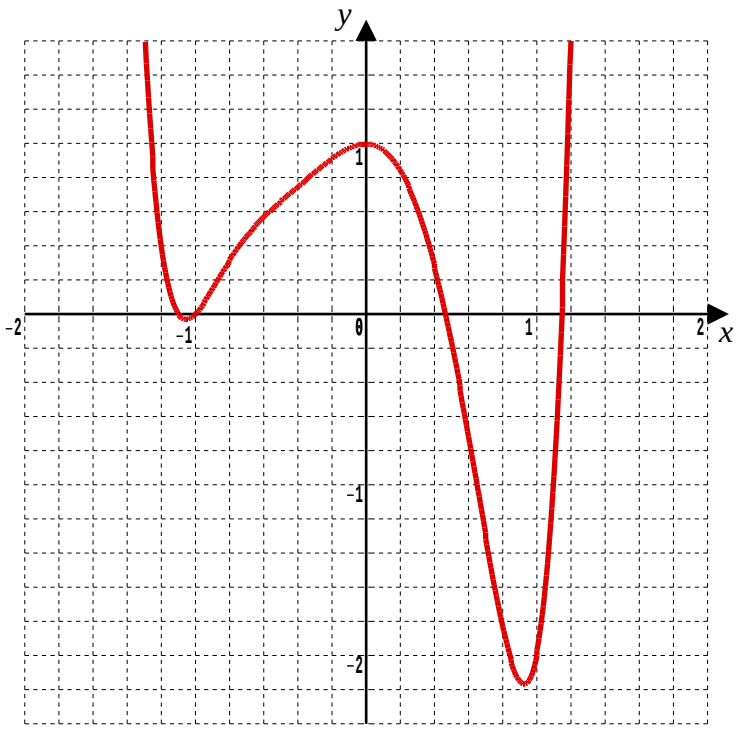
(iii) $\sqrt{0.16}$ **(iv)** $(-1)^{1001}$

[4 marks]

Question 4

The graph is of the function

$$w(x) = x^8 + 3x^5 - 4x^3 - 3x^2 + 1$$



(i) Write down the gradient function, $w'(x)$

[2 marks]

(ii) Write down the bend detector function, $w''(x)$

[2 marks]

(iii) Use the appropriate function to find the point on this curve where $x = 1$

[2 marks]

(iv) Use the appropriate function to find the gradient of this curve when $x = 1$

[2 marks]

(v) Determine if the curve is bending anticlockwise or clockwise when $x = 1$

[2 marks]

Question 5

Differentiate the following taking care to write "$y =$" or "$\frac{dy}{dx} =$" as appropriate;

(i) $y = 24x^5$ **(ii)** $y = 4x^{-3}$ **(iii)** $y = 8x + 3$

[1, 1, 1 marks]

(iv) $y = (2x + 3)^2$ Hint : Begin by expanding the brackets

[2 marks]

(v) $y = \sqrt{x}$ Hint : Begin by writing it in the form $y = x^n$

[2 marks]

(vi) $y = \frac{1}{x^4}$ Hint : Begin by writing it in the form $y = x^n$

[2 marks]

Question 6

Write down the exact value of the following:

(i) $\left(\frac{11}{5}\right)^{-2}$ **(ii)** 0.04^3

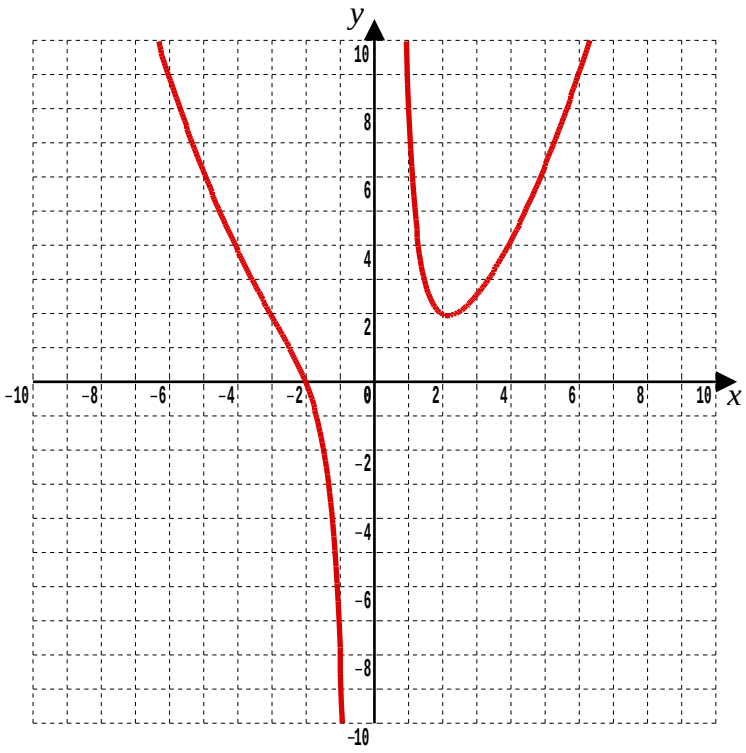
[2, 2 marks]

(iii) $\left(1 + \frac{9}{16}\right)^{\frac{1}{2}}$ **(iv)** $\left(-\frac{3}{4}\right)^{-3}$

[2, 2 marks]

Question 7

The graph is of the function $s(x) = \frac{8}{x^3} + \frac{x^2}{4}$



(i) Write down the gradient function, $s'(x)$

[3 marks]

(ii) Write down the bend detector function, $s''(x)$

[3 marks]

(iii) Use the appropriate function to find the point on this curve where $x = 2$

[2 marks]

(iv) Use the appropriate function to find the gradient of this curve when $x = 2$

[2 marks]

(v) Determine if the curve is bending anticlockwise or clockwise when $x = 2$

[2 marks]

Question 8

Differentiate the following taking care to write "$y =$" or "$\frac{dy}{dx} =$" as appropriate;

(i) $y = 9x^4 - 8x^{-2}$

(ii) $y = 22x^4 + \frac{12}{x^4}$

(iii) $y = x^8\left(4x^3 + 7x^2\right)$

(iv) $y = \frac{1}{5x^2}$

(v) $y = \frac{7x^3}{11}$

(vi) $y = \frac{x^9 + 6x^5}{2x^3}$

[18 marks]