Exam Questions – Differentiation: More Trigonometric Functions

Q1.

(i) Given that

$$x = sec^2 2y, \quad 0 < y < \frac{\pi}{4}$$

Show that $\frac{dy}{dx} = \frac{1}{4x\sqrt{x-1}}$

(4)

(ii) Given that

$$y = (x^2 + x^3) \ln 2x$$

Find the exact of $\frac{dy}{dx}$ $at\ x = \frac{e}{2}$, giving your answer in its simplest form

(5)

(Total Marks 9)

Q2.

(a) Differentiate

$$\frac{\cos 2x}{\sqrt{x}}$$

with respect to x.

(3)

(b) Show that $\frac{d}{dx}(\sec^2 3x)$ can be written in the form

$$\mu(\tan 3x + \tan^3 3x)$$

where μ is a constant.

(3)

(c) Given $x = 2 \sin\left(\frac{y}{3}\right)$, find $\frac{dy}{dx}$ in terms of x, simplifying your answer.

(4)

(Total 10 marks)

Q3.

(i) Differentiate with respect to x

(a) $y = x^3 \ln 2x$

(b) $y = (x + \sin 2x)^3$

(6)

Given that $x = \cot y$,

(ii) show that $\frac{dy}{dx} = \frac{-1}{1+x^2}$

(5)

(Total 11 marks)

Q4.

The current, I amps, in an electric circuit at time t seconds is given by

$$I = 16 - 16(0.5)^t \text{ , } t \geqslant 0$$

Use differentiation to find the value of $\frac{dI}{dt}$ when $t = 3$.

Give your answer in the form ln a, where a is a constant.

(5)

(Total 5 marks)

Q5.

Differentiate with respect to x, giving your answer in its simplest form,

(a) $x^2 \ln(3x)$

(4)

(b) $\dfrac{\sin 4x}{x^3}$

(5)

(Total 9 marks)

Q6.

(a) Differentiate with respect to x,

(i) $e^{3x}(\sin x + 2\cos x)$,

(3)

(ii) $x^3 \ln(5x + 2)$.

(3)

(Total 5 marks)