

Year 2 Pure Chapter 9: Trig Functions, Exponentials and Logs
Exam Questions (Total Marks 49)

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

(5)

(Total 9 marks)

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

$$I = 16 - 16(0.5)^t, t \geq 0$$

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) $\frac{\sin 4x}{x^3}$

(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)