



QUESTION THREE

(a) Find the appropriate first derivative in each of the following:

(i) $S = \frac{3}{t^3} - \frac{4}{\sqrt{t^3}} + 5\sqrt{t^3}$

(ii) $p = 4q^2 \sin 4q$

(iii) $m = \frac{6n-2}{n^2+1}$

(iv) $a = \ln(b^2 - 4b + 3)$

(v) $d = e^{(4f^2 + 3f - 1)}$

(vi) $z = \frac{4}{(y^2 - 3y)^{12}}$

(17 marks)

(b) If $z = \frac{3x-2y}{x+y}$ find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$, by using the Quotient Rule of differentiation.
Hence, evaluate each when $x = -1$ and $y = -2$

(8 marks)

QUESTION FOUR

(a) If $y = A \sin x + B \cos x$, where A and B are constants, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$

Hence show that $\frac{d^2y}{dx^2} + y = 0$

(6 marks)

This is a differential equation of which order?

(b) Express $\frac{11x-7}{(x-1)(2x-1)}$ in partial fractions. Hence differentiate it to find its first derivative.

(8 marks)

(c) Factorise the quadratic expression $4x^2 - x - 3$. Hence solve the trigonometric equation $4\tan^2 x - \tan x - 3 = 0$ giving your solutions in the range 0° to 360° .

(7 marks)

(d) Use the laws of logs to solve the following logarithmic equation for x

$$2\ln x - \ln(x-1) = \ln(x-2)$$

(4 marks)