

QUESTION THREE

(a) Find the value/s of x which satisfy the following equations:

(i) $3^{x+2} = 405$

(ii) $2\ln(x-4) = \ln(x-3) + \ln(x+9)$

(iii) $15x^2 - 2x - 8 = 0$

(iv) $\frac{x-4}{3} - \frac{2x-1}{5} = \frac{3}{4}$

(14 marks)

(b) Factorise the quadratic expression $x^2 + x - 12$

Hence, solve the trigonometric equation $\tan^2 x + \tan x = 12$

(6 marks)

giving solutions in the range $0^\circ < x < 360^\circ$

(c) Prove that $y = A \cos 2x + B \sin 2x + 1$ where A and B are constants is the general solution of the differential equation.

(5 marks)

$$\frac{d^2 y}{dx^2} + 4y = 4$$

QUESTION FOUR

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

(i) $S = 3t^2(t^2 - 4t + 1)$

(ii) $m = \sin n \cos 2n$

(iii) $a = e^{\tan b}$

(iv) $z = (2 + \ln y)^4$

(v) $p = \ln(3q - 2 + e^{4q})$

(vi) $d = \frac{3e-1}{2e^2+4}$

(16 marks)

Simplify your answers where possible.

(b) If $y = \frac{1}{\sqrt{x^2+1}}$, use the function of a function technique, and not the quotient rule to find $\frac{dy}{dx}$.

(3 marks)

Simplify your answer.

(c) If $a = 3b^2c - \sin 2b \cos 3c$ find all four second order partial derivatives.

(6 marks)