

- a. Find all the second order derivatives for $f(x, y) = \cos(2x) - x^2e^{5y} + 3y^2$ [5marks]
- * b. State Clairaut's theorem [2marks]
- c. Show that the following series converges $(x = e^{-1})$
- i. $\sum_{n=1}^{\infty} \frac{n^3-1}{4n^5-3n^2+3}$ [4marks]
- ii. $\sum_{n=1}^{\infty} \left[\frac{n+1}{n^2+1} \right]^2$ [4marks]
- * d. State Weierstrass M-Test hence apply it to Evaluate $\sum_{n=1}^{\infty} \frac{\sin n^x}{n^2}$ [5marks]
- * e. Determine the point on the plane $4x - 2y + z = 1$ that is closest to the point $(-2, -1, 5)$ [5marks]
- * f. Using the method of Lagrange Multipliers Find the relative minimum of the function $f(x, y) = 2x^2 + y^2$ subject to the constraint $x + y = 1$. [5marks]

$\frac{d^2}{dx^2} = \dots (C-P)$

$\frac{d^2}{dx^2} = \dots (5000 - 0)$

$Q(x) = \frac{500x}{1 + Ae^{5000x}}$
 $Q'(x) = \frac{250 - 500x}{1 + A}$