Assignment- 11 : Maxima, Minima, Lagrange Multipliers

1. Examine the following functions for local maxima, local minima and saddle points:

   $i)\ (x^2+y^2)\exp^{-(x^2+y^2)}$ $\quad ii)\ x^2+3xy+y^2$ $\quad iii)\ 3x^4-4x^2y+y^2$ $\quad iv)\ x\sin y.$

2. let $f(x,y) = 3x^4 - 4x^2y + y^2$. Show that f has a local minimum at $(0,0)$ along every line through $(0,0)$. Does f have a minimum at $(0,0)$? Is $(0,0)$ a saddle point for f?

3. Find the absolute maxima of $f(x,y) = xy$ on the unit disc $\{(x,y):\ x^2+y^2 \leq 1\}$.

4. Assume that among all rectangular boxes with fixed surface area of 20 square meters, there is a box of largest possible volume. Find its dimensions.

5. L&T produces steel boxes at three different plants in amounts x, y and z, respectively, producing an annual revenue of $R(x,y,z) = 8xyz^2 - 200(x+y+z)$. The company is to produce 100 units annually. How should production be distributed to maximize revenue?

6. Find the point on the line of intersection of two planes $3x + 4y + 5z = 0$ and $2x + y + 3z = 5$ that is nearest to the origin.

7. Minimize the quantity $x^2 + y^2 + z^2$ subject to the constraints $x + 2y + 3z = 6$ and $x + 3y + 9z = 9$.