Some Extra Problems

A H M MAHBUBUR RAHMAN, PhD

Practice Problems:

1. Transform the conics into its standard form, and find its vertices, eccentricity, foci, equation of directrices, equation of Latus rectum, length of Latus rectum.

i.

$$3y^2 + 6x - x^2 - 12y = 0.$$

ii.

$$x^2 + 4x + 4y^2 - 8y + 4 = 0.$$

iii.

$$9x^2 - 18x + 4y^2 + 16y - 11 = 0.$$

iv.

$$2x^2 + 4x - y^2 + 4y - 4 = 0.$$

v.

$$y^2 - 4x^2 - 16x - 2y - 19 = 0.$$

2. Find 3^{rd} order partial derivatives of the following function **with respect to** x and **convert** the point $(2, 1, 3)$ to spherical coordinate.

1. $f(x, y, z) = 2x^3y + e^{zx} + z^2y.$
2. $f(x, y, z) = ln(2x^3y + zx + z^2y).$

3. Let $w = yz^2 - x^3$, and let $x = e^{r-t}, y = ln(r + 2s + 3t)$, and $z = \sqrt{rs + t}$. Calculate $\frac{\partial w}{\partial r}$, $\frac{\partial w}{\partial s}$, and $\frac{\partial w}{\partial t}$.

4. Let $z = f(x, y) = sin(xy^2)$. Suppose that $x = \frac{r}{s}$ and $y = e^{r-s}$. Calculate $\frac{\partial z}{\partial r}$, and $\frac{\partial z}{\partial s}$.

5. Find extreme values of the following function

$$f(x, y, z) = xyz$$

subject to the constraint $x^2 + y^2 + z^2 = 3$ using Legrange multiplier.

6. Use the method of Lagrange multipliers to find the minimum value of the function

$$f(x, y, z) = x + y + z$$

subject to the constra $x^2 + y^2 + z^2 = 1$.