Module 1

Q1.

If $f(x, y) = x^3y - xy^3$, find $\left[\dfrac{1}{\frac{\partial f}{\partial x}} + \dfrac{1}{\frac{\partial f}{\partial y}}\right]_{\substack{x=1\\y=2}}$ **Ans.** $-\dfrac{13}{22}$

Q 2.

If $x = r\cos\theta$, $y = r\sin\theta$, prove that

$$(i)\ \frac{\partial r}{\partial x} = \frac{\partial x}{\partial r},\ r.\frac{\partial \theta}{\partial x} = \frac{1}{r}.\frac{\partial x}{\partial \theta} \qquad (ii)\ \frac{\partial^2\theta}{\partial x^2} + \frac{\partial^2\theta}{\partial y^2} = 0$$

Q 3

Find the maximum and minimum distances of the point (3, 4, 12) *from the sphere* $x^2 + y^2 + z^2 = 1$.

4. $f(x, y) = \begin{cases} \dfrac{xy}{x^2+y^2}, & \text{when } x \neq 0, y \neq 0 \\ 0, & \text{when } x = 0, y = 0 \end{cases}$

at origin. **Ans.** Not continuous at origin.

5. $f(x, y) = \begin{cases} x^3 + y^3, & \text{when } x \neq 0, y \neq 0 \\ 0, & \text{when } x = 0, y = 0 \end{cases}$

at origin. **Ans.** Continuous at origin.

Q6.

Show that the function

$$f(x,y) = x^3 + y^3 - 63(x + y) + 12xy$$

is maximum at $(-7, -7)$ *and minimum at* $(3, 3)$.