

**SRM Institute of Science and Technology**  
**DEPARTMENT OF MATHEMATICS**  
**21MAB101T: Calculus and Linear Algebra**  
**ACADEMIC YEAR 2022-2023 (ODD)**  
**Tutorial-3 (Unit-2)**

1. Show that the rectangular solid of maximum volume that can be inscribed in a sphere is a cube.
2. If  $u = a^3x^2 + b^3y^2 + c^3z^2$  where  $x^{-1} + y^{-1} + z^{-1} = 1$ , show that the stationary value of  $u$  is given by  $x = \frac{\sum a}{a}, y = \frac{\sum a}{b}, z = \frac{\sum a}{c}$ , where  $\sum a = a + b + c$ .
3. If  $u = x + 3y^2 - z^3, v = 4x^2yz, w = 2z^2 - xy$ , evaluate  $\partial(u, v, w)/\partial(x, y, z)$  at  $(1, -1, 0)$ .
4. If  $u = x^2 - y^2, v = 2xy$  and  $x = r\cos\theta, y = r\sin\theta$ , find  $\frac{\partial(u,v)}{\partial(r,\theta)}$ .
5. If  $u = xyz, v = x^2 + y^2 + z^2, w = x + y + z$ , find  $\partial(x, y, z)/\partial(u, v, w)$ .