

Progressive Education Society's
Modern College of Arts, Science and Commerce (Autonomous),
Shivajinagar, Pune - 5

Department Of Mathematics
SYBSC (Semester IV) 19ScMatU403

Based on Vector Calculus

Subject : Mathematics Practical-IV (19ScMatU403)
Practical Incharge: Rima Ahuja

Practical 1: Vector Function of One Variable

1. If three mutually perpendicular unit vectors $\bar{a}, \bar{b}, \bar{c}$ are functions of t , then prove that
$$\frac{d\bar{a}}{dt} = \pm \left(\frac{d\bar{b}}{dt} \times \bar{c} + \bar{b} \times \frac{d\bar{c}}{dt} \right).$$
2. If $\bar{u} = (t^2 - 1) \hat{i} + \cos t \hat{j}, \bar{v} = \sin t \hat{i} + e^t \hat{j}$ then find $\lim_{t \rightarrow 0} (\bar{u} \times \bar{v})$.
3. If $\bar{f} = \frac{\tan 4x}{x} \hat{i} + \frac{\log(1+2x)}{x} \hat{j} + \frac{3^x - 1}{x} \hat{k}, x \neq 0$ then find $\bar{f}(0)$ if \bar{f} is continuous at $x = 0$.
4. Find the unit tangent vector to the curve $x = t^2, y = 2t, z = \frac{-1}{2}t^2$ at the point $t = -3$.
5. Find the acute angle between tangents to the curve $\bar{r} = t\hat{i} + t^2\hat{j} + t^3\hat{k}$ at $t = 1$ and $t = -1$.