

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 2: Partial Derivatives and Gradient

1. $\phi = xyz$, $\bar{u} = yz \hat{i} + zx \hat{j} + xy \hat{k}$ Find $\frac{\partial^3(\phi u)}{\partial x^2 \partial z}$ at $(1, 2, 1)$.
2. If $\bar{r} = e^{-\lambda x} (\bar{a} \sin \lambda y + \bar{b} \cos \lambda y)$ then prove that $\frac{\partial^2 \bar{r}}{\partial x^2} + \frac{\partial^2 \bar{r}}{\partial y^2} = 0$.
3. Prove that $\nabla f(r) = f'(r) \nabla r$. Hence find $\nabla(\sin^2 r)$.
4. $\bar{a} = \alpha x \hat{i} + \beta y \hat{j} + \gamma z \hat{k}$ prove that $\nabla(\bar{a} \cdot \bar{r}) = 2\bar{a}$.
5. If $\nabla \phi = 2xyz^3 \hat{i} + x^2z^3 \hat{j} + 3x^2yz^3 \hat{k}$ then find ϕ if $\phi(1, 1, 1) = 1$.