# Mathematics-III

## Vector Integration
## Tutorial 2

1. Find the workdone in a force field $\bar{F} = (y^2 cosx + z^2)\bar{i} + (2ysinx - 4)\bar{j} + (3xz^2 + 2)\bar{k}$ moving in a particle from $(0, 1, -1) to (\pi/2, -1, 2)$.Is the field conservative?

2. Verify Green's theorem for $\bar{F} = x\bar{i} + y^2\bar{j}$ over the first quadrant of the circle $x^2 + y^2 = a^2$.

3. Evaluate $\iint_S (2xy\bar{i} + yz^2\bar{j} + xz\bar{k}) \cdot d\bar{s}$ over the surface of the region bounded by $x = 0, y = 0, y = 3, z = 0$ and $x + 2z = 6$

4. Evaluate $\iint_S (\nabla \times \bar{F}) \cdot \hat{n}\ ds$ where S is the curved surface of paraboloid $x^2 + y^2 = 2z$ bounded by the plane $z = 2$, where
$$\bar{F} = 3(x - y)\bar{i} + 2xz\bar{j} + xy\bar{k}$$

5. Use Stoke's theorem to evaluate $\int_c (4y\bar{i} + 2z\bar{j} + 6y\bar{k}) \cdot d\bar{r}$, where C is the curve of intersection of $x^2 + y^2 + z^2 = 2z$ and $x = z - 1$.

6. Evaluate $\int_c \bar{F} \cdot d\bar{r}$ for $\bar{F} = 3x^2\bar{i} + (2xz - y)\bar{j} + z\bar{k}$ along the straight line joining the points $(0, 0, 0)$ and $(2, 1, 3)$

7. Evaluate $\iint_S [xz^2 dydz + (x^2y - z^2)dzdx + (2xy + y^2z)dxdy]$, where S is the surface enclosing a region bounded by hemisphere $x^2 + y^2 + z^2 = 4$ above the XOY plane.