# Assignment 13 : Triple Integrals, Surface Integrals, Line integrals

1. **(D)** Integrate $ze^{x^2+y^2}dxdydz$ over the cylinder $x^2+y^2 \leq 4,\ 2 \leq z \leq 3$.

2. **(T)** Evaluate the integral $\iiint_W \frac{dzdydx}{\sqrt{1+x^2+y^2+z^2}}$; where $W$ is the ball $x^2+y^2+z^2 \leq 1$.

3. **(D)** Find the area of the surface of the portion of the sphere $x^2+y^2+z^2 = 4a^2$ that lies inside the cylinder $x^2+y^2 = 2ax$.

4. **(T)** What is the integral of the function $x^2z$ taken over the entire surface of a right circular cylinder of height $h$ which stands on the circle $x^2+y^2 = a^2$. What is the integral of the given function taken throughout the volume of the cylinder.

5. **(D)** Compute $\iint_S xyd\sigma$, where $S$ is the surface of the cone $x = r\cos t,\ y = r\sin t, z = r$ for $0 \leq r \leq 1$ and $0 \leq t \leq 2\pi$.

6. **(T)** Find the line integral of the vector field $F(x,y,z) = y\vec{i} - x\vec{j} + \vec{k}$ along the path $\mathbf{c}(t) = (\cos t, \sin t, \frac{t}{2\pi})$
$0 \leq t \leq 2\pi$ joining $(1,0,0)$ to $(1,0,1)$.

7. **(D)** Evaluate $\int_C \frac{-ydx+xdy}{x^2+y^2}$, where $C := \{(x,y) : x^2+y^2 = 1\}$.

8. **(T)** Evaluate $\int_C T \cdot dR$, where $C$ is the circle $x^2+y^2 = 1$ and $T$ is the unit tangent vector.

9. **(T)** Show that the integral $\int_C yzdx + (xz+1)dy + xydz$ is independent of the path $C$ joining $(1,0,0)$ and $(2,1,4)$.