

Math 2371 Calc III

Sample Test 3

1. Set up the limits of integration for the triple integral

$$\iiint f(x, y, z) dV$$

where

(i) $x = 0, y = 0, y = 1, z = 0, z = 1 - x^2$

(ii) $x = 0, x = 1, y = 0, y = 1, z = 0, z = 2 - x$

2. Set of the triple integral $\iiint f(x, y, z) dV$ in both cylindrical and spherical coordinates for the volume inside both the hemisphere $x^2 + y^2 + z^2 = 8$ and the cone $z^2 = x^2 + y^2$

3. Using a change of variable, evaluate the following double integrals

(i) $\iint \frac{2x^2+y}{y^2} dA$ where R is bound by $y = 2x, y = x, y = 1 - x^2, y = 2 - x^2$

(ii) $\iint y^2 - x^2 dA$ where R is bound by $y = x + 1, y = x - 1, y = -x + 1, y = -x - 1$

4. Is the following vector field conservative?

$$\vec{F} = \langle 2xy, x^2 + z^2, 2yz \rangle .$$

If so, determine the potential function f such that $\vec{F} = \vec{\nabla} f$.

5. Evaluate the following line integrals

(i) $\int_C 2y ds$ where C is the portion of the curve $y = x^2$ from $(0,0)$ to $(2,4)$.

(ii) $\int_C y dx + x^2 dy$ where C is the boundary of the region bound by $y = x, y = 1$ and $x = 0$.