

Name: _____

Section: _____

1. Let $F(x, y) = (x^3 + 4xy)\mathbf{i} + (2x^2 - y^3)\mathbf{j}$ be a vector field in $R^2(x, y)$.
 - a) Show that F is conservative by finding a potential function.
 - b) Compute $\int_c F \cdot dr$, where c is any curve that begins at $(0,0)$ and ends at $(1,1)$.

2. **Using double integral**, find the surface area of the part of surface $z = 1 + 3x + 2y^2$ that lies above the triangle with vertices $(0,0)$, $(0,1)$, $(2,1)$ in xy -plane.

3. Using triple integral and the spherical coordinates, compute the volume of a sphere of radius a .

4. Evaluate $\int_C (5y + e^{\sin x + \ln x})dx + (7x + \frac{1}{1+y^2})dy$, where C is the circle $(x-1)^2 + y^2 = 4$.

5. Using Green's theorem, evaluate

$$\int_c \frac{-y}{x^2 + y^2} dx + \frac{x}{x^2 + y^2} dy,$$

where c is the polygonal path obtained by joining the points $(1,1)$, $(-1,1)$, $(-1,-1)$, $(1,-1)$ and back to $(1,1)$ by the line segments determined by two consecutive points and traversed counterclockwise.

Note: You will have to explain how you have reached your conclusion and your work.

Good Luck!!