

Math 250B Assignment 4

Covers: Sections 14.1-14.4

Due: Mon Dec 1 at 11:30am

INSTRUCTIONS:

This assignment will be marked for completion.

Solutions will be posted on the course website 24 hours after the deadline.

You may not copy the work of another person or AI.

Submit jpg or pdf files to the D2L Dropbox.

1. Calculate the divergence and curl of $\mathbf{F} = [x^2 - yz, e^y - xz, z^3 - y^2]$.

2. Evaluate $\int_C (2x + 3z) \, ds$, where C is given by:

$$x = 3 \cos t, \quad y = 3 \sin t, \quad z = 4t, \quad 0 \leq t \leq 4\pi$$

3. Consider the conservative vector field $\mathbf{F} = [2x, 3y^2z, y^3 - 2z]$.

a) Find a potential for $\mathbf{F}$

b) Let C be any path from $(1, 2, 3)$ to $(4, 3, 5)$. Evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$

4. Let C be the part of $y = x^2$ from $(0, 0)$ to $(2, 4)$ followed by the straight line segment from $(2, 4)$ to $(0, 0)$. Use Green's Theorem to evaluate:

$$\oint_C [\arctan e^x \, dx + (x^2 + \arcsin e^y) dy]$$

5. Use the 2D Divergence Theorem to calculate the flux of

$\mathbf{F} = [xy^2, x^2y + \ln(\sin x)]$ across the circle of radius 6 centred at the origin.