

MA 3330: Worksheet 3

1. Graph and show whether or no the field is conservative

$$\mathbf{F}(x, y) = 3i + xj$$

2. Show the field is conservative.

$$\mathbf{F}(x, y) = \langle ye^x + \sin(y), e^x + x\cos(y) \rangle$$

Compute $\int_C \mathbf{F} \cdot d(\mathbf{r})$ where C is the outside of the semicircle $y = \sqrt{4 - x^2}$ starting at $(2, 0)$ and ending at $(-2, 0)$.

3. Compute

$$\oint_C 2 \arctan\left(\frac{y}{x}\right) dx + \ln(x^2 + y^2) dy$$

where C is defined by $x = 4 + \cos \theta$, $y = 4 \sin \theta$ oriented in counterclockwise direction.

4. For $\mathbf{F}(x, y) = xyi + y^2j$ around and over the boundary of the region enclosed by curves $y = x^2$ and $y = x$. Compute the integral as follows

$$\oint_C \mathbf{F} \cdot d\mathbf{r}.$$

- (a) Using line integral
- (b) Using Green's Theorem