

Homework 5

Due date: May 4th, 2017

Problem 1: Evaluate $\int_C 2x ds$, where C consists of the arc C_1 of the parabola $y = x^2$ from $(0, 0)$ to $(1, 1)$ followed by the vertical line segment C_2 from $(1, 1)$ to $(1, 2)$.

Problem 2: Evaluate the line integral $\int_C \mathbf{F} \cdot d\mathbf{r}$, where C is given by the vector function $\mathbf{r}(t)$.

(a) $\mathbf{F} = xy^2 \cdot \mathbf{i} - x^2 \cdot \mathbf{j}$, and $\mathbf{r}(t) = t^3 \cdot \mathbf{i} + t^2 \cdot \mathbf{j}$, $0 \leq t \leq 1$.

(b) $\mathbf{F} = \sin x \cdot \mathbf{i} - \cos y \cdot \mathbf{j} + xz \cdot \mathbf{k}$, and $\mathbf{r}(t) = t^3 \cdot \mathbf{i} - t^2 \cdot \mathbf{j} + t \cdot \mathbf{k}$, $0 \leq t \leq 1$.

Problem 3: Let

$$\mathbf{F}(x, y, z) = y^2 \cdot \mathbf{i} + (2xy + e^{3z}) \cdot \mathbf{j} + 3ye^{3z} \cdot \mathbf{k}.$$

(a) Calculate the curl of \mathbf{F} . Is it conservative?

(b) Find a potential for \mathbf{F} . Is it conservative?