

Box # _____

Math 60

HW 11

Due June 1, 2016

Problems: 6.2.{R10, 13, 15}, 6.3.{1, 3, 4, R7, 25, R26, 33}

Problem 6.2.13

Evaluate $\oint_C (x^4 y^5 - 2y) dx + (3x + x^5 y^4) dy$, where C is the oriented curve pictured in Figure 6.29.

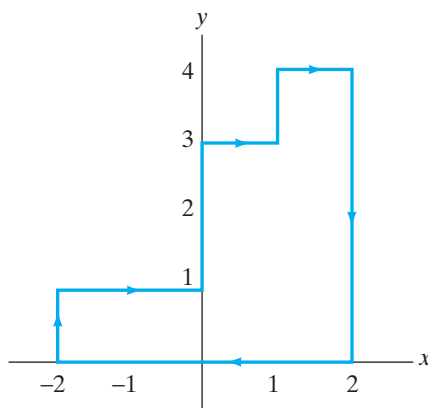


FIGURE 6.29. The oriented curve C of Exercise 13.

Problem 6.2.15

- (a) Sketch the curve given parametrically by $\mathbf{x}(t) = [1 - t^2, t^3 - t]$.
- (b) Find the area inside the closed loop of the curve.

Problem 6.3.1

Consider the line integral $\int_C z^2 dx + 2y dy + xz dz$.

- (a) Evaluate this integral, where C is the line segment from $(0,0,0)$ to $(1,1,1)$.
- (b) Evaluate this integral, where C is the path from $(0,0,0)$ to $(1,1,1)$ parametrized by $\mathbf{x}(t) = [t, t^2, t^3], 0 \leq t \leq 1$.
- (c) Is the vector field $\mathbf{F} = [z^2, 2y, xz]$ conservative? Why or why not?

Problem 6.3.3

Determine whether the vector field $\mathbf{F} = [e^{x+y}, e^{xy}]$ is conservative. If it is, find a scalar potential function for \mathbf{F} .

Problem 6.3.4

Determine whether the vector field $\mathbf{F} = [2x \sin y, x^2 \cos y]$ is conservative. If it is, find a scalar potential function for \mathbf{F} .

Problem 6.3.25

Let $\mathbf{F} = [x^2, \cos y \sin z, \sin y \cos z]$.

- (a) Show that \mathbf{F} is conservative and find a scalar potential function f for \mathbf{F} .
- (b) Evaluate $\int_{\mathbf{x}} \mathbf{F} \cdot d\mathbf{s}$ along the path $\mathbf{x} : [0, 1] \rightarrow \mathbb{R}^3$, $\mathbf{x}(t) = [t^2 + 1, e^t, e^{2t}]$.

Problem 6.3.33

(a) Determine where the vector field

$$\mathbf{F} = \left[\frac{x + xy^2}{y^2} \quad -\frac{x^2 + 1}{y^3} \right]$$

is conservative.

(b) Determine a scalar potential for \mathbf{F} .

(c) Find the work done by \mathbf{F} in moving a particle along the parabolic curve $y = 1 + x - x^2$ from $(0, 1)$ to $(1, 1)$.