LB 220, Sections 001 & 002, Fall 2015
Homeworks 10 & 11 (due 12/7)

Instructions: Please write your solutions to the problems below on a clean piece of paper (not this piece of paper). Show the steps taken to arrive at each answer.

You may work with other students on homework problems. For this assignment, each student must submit his or her own solutions to all of the problems. The first and third problems are actual exam problems from previous semesters.

1. Let C be the straight line segment from $(0, 0)$ to $(1, 2)$. Compute $\int_C xy\, ds$.

2. Determine the work done by the vector field

$$\mathbf{F} = (y - z)\,\mathbf{i} + (z - x)\,\mathbf{j} + (x - y)\,\mathbf{k}$$

on a particle that moves along the line segment from $(1, 0, 1)$ to $(3, 1, 1)$.

3. Let R be the region in $\mathbb{R}^2$ enclosed by the square having vertices $(1, 1)$, $(-1, 1)$, $(-1, -1)$, and $(1, -1)$. Let C be the boundary of R with a counter-clockwise orientation. Let $\mathbf{F}(x, y) = -y\,\mathbf{i} + x\,\mathbf{j}$

   (a) Compute the integral below.

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

   (b) Is the vector field $\mathbf{F}(x, y)$ conservative? Explain.

   (c) Let $\mathbf{G}(x, y) = x\,\mathbf{i} + y\,\mathbf{j}$. Compute the integral below.

$$\oint_C \mathbf{G} \cdot d\mathbf{r}$$

4. Use Green's Theorem to compute the value of the line integral below where C is the circle $x^2 + y^2 = a^2$ of radius $a > 0$ traversed once in a counter-clockwise direction.

$$\int_C y^3\, dx - x^3\, dy$$