Math 233 - November 10, 2009

- Parametrizing curves
- Proof of Green's Theorem
- General version of Green's Theorem

1. Parametrize the following curves

   (a) The curve that is the graph of $y = x^3$ between $x = 1$ and $x = 4$, parametrized from left to right.

   $$r(x) =$$

   (b) The curve that is the graph of $x = \sin y$ between $y = 0$ and $y = \pi$, parametrized from bottom to top.

   $$r(y) =$$

   (c) The curve that is the graph of the polar equation $r = 1 + \sin\theta$.

   $$r(\theta) =$$

2. Find the area enclosed by the graph $r = 1 + \sin\theta$.

   Can you do this by setting up a line integral?

Lecture Problems

3. Let C be the rectangle with vertices $(2, 1)$, $(6, 1)$, $(6, 4)$ and $(2, 4)$, oriented positively. Use Green's Theorem to find the line integral:

   $$\oint_C (e^{3x} + 2y)\, dx + (x^2 + \sin y)\, dy =$$

4. Let C be the square with vertices $(0, 0)$, $(1, 0)$, $(1, 1)$ and $(0, 1)$. Find the work done by the vector field $F = (y, x^2 y)$ around C in the counter-clockwise direction.