Worksheet 1 (10/23/2014)

Exercise 0.1.
Find the length of the curve \( C \) parameterized by \( c(t) = (3t^2, -t^3, 2t^3) \), for \( 0 \leq t \leq 1 \) [Spring 2006 Final]

Exercise 0.2.
Let \( c(t) = (t, 3, -t) \) for \( 0 \leq t \leq 4 \) represent a curved wire. Suppose the density at the point \((x, y, z)\) is given by \( f(x, y, z) = x \). Find the total mass of the wire. [Spring 2011 midterm 2]
Exercise 0.3.
Sketch the vector field or a small multiple for

- \( F(x, y) = (2, 2) \).
- \( F(x, y) = (2y, x) \).

Exercise 0.4.
Sketch a vector field where the flow is directed away from the origin in all directions, but whose divergence is negative. (Note: If you don’t understand this question, check out the page on mathinsight.org, if you are still confused, ask for help.)

Exercise 0.5.
Consider the vector field \( F(x, y, z) = (xe^y, xy^2z, xy^3e^x) \). Find \( \text{div}(F) \) and \( \text{curl}(F) \). [Spring 2011 Midterm 2]