Homework 7
(due Friday, March 20)

For the sake of staying in good technical shape, I advise/encourage you to do as many integrals as you can on this assignment by <u>hand</u> and rely on e.g. Mathematica only to check your answers.

Turn in answers only.

From Jones, Chapter 2: 2-13, 2-15

8.3: 1acef, 2ac (Don't forget to sketch the curves and explain 'coincidences' among the answers)

Problem 1. Compute the arc-length integral $\int_\gamma f\,ds$ for

(a) $\gamma : [1,3] \to \mathbf{R}^3$ given by $\gamma(t) = (t, 3t, 2t)$ and $f : \mathbf{R}^3 \to \mathbf{R}$ given by $f(x,y,z) = yz$.
(b) $\gamma : [0, 2\pi] \to \mathbf{R}^3$ given by $\gamma(t) = (\sin t, \cos t, t)$ and $f : \mathbf{R}^3 \to \mathbf{R}$ given by $x + y + z$.

Turn in full solutions.

From the 1st midterm: 2 (find and give countere.g.s to all 4 false statements),7ab (don't use cylindrical or spherical coordinates in a)

8.3: 3abd, 4 (you can use Mathematica on this one)

From Jones, Chapter 11: 11-1

Problem 2. Find a parametrization for the path from $(0,0,0)$ to $(1,1,\sqrt{2})$ along the intersection between the surfaces $\{x^2 + y^2 = z^2\}$ and $\{y^2 = x\}$.

Problem 3. Compute the average distance to the origin among points on the circle in $\mathbf{R}^2$ with center $(1,0)$ and radius 1.

Problem 4. The graph $\{(x, f(x)) \in \mathbf{R}^2 : x \in [a,b]\}$ of a C^1 function $f : [a,b] \to \mathbf{R}$ is a curve which may be parametrized by it's x-coordinate, i.e. by $\gamma : [a,b] \to \mathbf{R}$ given by $\gamma(t) = (t, f(t))$. Use this parametrization to obtain the following formula for the length of the graph of f:

$$\int_a^b \sqrt{1 + f'(x)^2}\,dx.$$