Math 142, Problem Set #8
(due **in class** Fri., 4/4/14)

Note: To get full credit for a problem, it is not enough to give the right answer; you must explain your reasoning.

Stewart, section 7.4, problem 10, 16, 28(ab). (Hint: For problems 10 and 16, the answer is a rational number.)

Stewart, section 7.5, problems 6, 16, 22. (Hint: For problems 6 and 16, the answer is a rational number times π.)

Stewart, section 7.6, problems 6, 12, 26. (Note: For problem 12, it is easier to do the problem if you integrate with respect to distance rather than time.)

Stewart, section 7.7, problems 12, 21–24, 30.

Also:

A. Consider the solid of revolution obtained by taking the tilted square with corners $(1, 0)$, $(2, 1)$, $(2, -1)$, and $(3, 0)$ and revolving it around the y-axis (discussed in class). Use Pappus' Theorem to compute its volume.

B. Let R be the region lying between the lines $y = 0$ and $y = -d$ and the curves $x = f(y)$ and $x = g(y)$, with $f(y) \leq g(y)$ for all y in $[-d, 0]$. Suppose that a constant-density plate occupying the region R is immersed in a pool of depth d, going from $y = 0$ down to $y = -d$. Show that the hydrostatic force acting on R is equal to its area times the depth of its centroid times the weight-density of the fluid. (This fact is true for tilted regions as well as vertically oriented regions, but I decided that that was too hard for homework.)

C. Find all everywhere-differentiable functions $y = f(x)$ such that $dy/dx = 2y/x$ for all $x \neq 0$. (Hint: In class we derived the supposedly general solution $y = Ax^2$, but if you think that's all the solutions there are, consider $y = x|x|$, which is not of that form!)

Please don't forget to write down **who you worked on the assignment with** (if nobody, then write "I worked alone"), **and how much time you spent on each problem** (this doesn't need to be exact).