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 $\pi$.)

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).