Study Guide for 6.1, 6.2 and 6.3

6.1, 6.2: Solids of Revolution

You must know the *definition* of the volume of a solid with known integrable cross section $A(x)$, $a \leq x \leq b$ (so that if I give you such an $A(x)$ and an a and b, you can compute the volume of the solid).

You must be proficient at computing volumes of solids of revolution about any vertical or horizontal line (not just the x and y axes). Given an axis of revolution and a direction to slice the region, you need absolutely to understand whether you are producing shells or washers. (Slicing perpendicular to axis gives you washers, parallel gives you shells. Mental imagery, not memorization, will keep this straight.)

If you are given free choice of methods, recall that what you want to *choose* is the direction to slice the region, and you make this determination based on which direction makes it easiest to determine the coordinates of the endpoints of the slice. Practice doing this by looking for homework problems where you are free to choose the method.

If you are forced to use a specific method, then the direction of the slice is forced on you, and you may have to work a bit to find the coordinates of the endpoints. (E.g. If one of your curves is $y = \ln(x)$ and you are forced to slice parallel to the x-axis, i.e. to have y as your free variable, then you will have to express the x-coordinate as a function of y, i.e. rewrite the curve as $x = e^y$.) Practice doing this on homework problems where you are told which method you must use.

Mostly, practice just setting up the integrals, to get fast at it. But don't neglect to practice evaluating, too, since practice makes you faster at this, also.

6.3: Arclength

You must know *precisely* both the definition of length of a curve C parametrized by $x = f(t)$, $y = g(t)$, $a \leq t \leq b$, and the derived formula for the length of the graph of a function $y = f(x)$ on $a \leq x \leq b$ (or, of course, $x = f(y)$ on $a \leq y \leq b$). This is memorization. *Any* error in the formula will give you a zero on the problem! Beyond that, you are expected to have absorbed and to be able to repreoduce all of the tricks we used to evaluate the resulting integrals. We used "tricks" or special formulas of some sort for 6.3, #s 2, 6, 10, 16, 30. Can you do all of these without peeking? If not, go back and study the "trick."