Final exam review:

Old stuff. Review your previous tests. There will be similar stuff on the final (though less of it). What to look for:

Test 1:

- Left and right hand limits, and points of discontinuity. Yes, I might make you graph a piecewise defined function.
- Finding a derivative using the limit definition. Yes, it's likely I will put this on the final.
- Instantaneous and average velocities.

Test 2:

- Taking derivatives of all manner of functions. Almost certainly on the test.
- Equations of tangent lines. A fundamental calculus skill
- Implicit differentiation. Useful in calc II. Likely to be on the final.
- Related rates problem(s).

Test 3:

- One problem where you do everything. No, I'm not going to tell you in advance if it's a trig problem. There will be at least 1 trig problem on the test where you need to know my favorite right triangle. You also need to know the quadratic formula
- One max/min problem with a fence or a box or something like that.
- Maybe an infinite limit.

New stuff:

1. A problem where you are asked to make an approximation of an integral using some finite number of rectangles with either left endpoints, right endpoints, or midpoints specified. You will also be expected to sketch a diagram showing what you have calculated. For example:

a. Sketch the Left-endpoint picture using 8 rectangles that approximates $\int_{-2}^{2} x^2 - 1 dx$

b. Find the area given by the left-endpoint, 8 rectangle approximation that you sketched in a

c. Tell a way that you could get a more accurate approximation by rectangles.

2. More integrals. You're getting really good at these!

a. $\int x^{1/3}(2x+1)\,dx$

b. $\int \frac{3}{\sqrt{x}} - \frac{5}{x^2} + \csc x \cot x \; dx$

c. $\int_{\pi/4}^{\pi/2} \cot x \csc^4 x \; dx$

d. $\int_{0}^{\sqrt{\pi}} x \sin(x^2)\, dx$

e. $\int_{-\pi/2}^{\pi/2} \csc(x)\, dx$

f. $\int \sqrt{\sin x} \cos x \; dx$

g. $\int \frac{x}{(x^2+4)^6} + 4x \; dx$

h. $\int \frac{x}{\sqrt{x+2}}\, dx$

3. (Derivative of an integral problems) Find the derivative of:

a. $g(x) = \int_{\sin(x)}^{2} \sec(2t)\,dt$ b. $g(x) = \int_{-2}^{\sqrt{x}} \sqrt{t^4 + 5}\,dt$

4. Using integrals/anti-derivatives to use a velocity function to find a position function:
a. If the velocity of an object is: $v(t) = \sin(\pi t/5)$ (ft/sec), and s(0)=3, find the function that tells the position of the object.
b. Use the function you found in 4 to figure out the net distance the weight moves in the first 3 seconds (between t=0 and t=3)

5. A problem where you must find an area by using an integral. For example:
A. Find the area bounded by $y = \sqrt{x+4}$, $y = x$, x = -1, x = 2

B. Find the area bounded by $y = \sin x$, $y = \frac{1}{2}$, $x = 0$, and $x = \frac{\pi}{2}$

6. Volumes of solids by rotation. Upon due reflection, I believe I will have you set up, but not integrate a few of these (as opposed to setting up and integrating just one). For practice, set up (but don't integrate--unless you really want to)
A. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$ and $y = 2x$ about the x-axis by disks/washers
B. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$, $y = 4$, $x = 0$ around the y-axis by disks/washers.
C. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$ and $y = 2x$ about the y-axis by cylinders
D. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$ and $y = 2x$ about the x-axis by cylinders

7. Work. I think I will put a rope-type work problem on the test. How about this one: rope that is 20 ft. long has a 10 lb. weight attached to the end of it, and it is hanging over a wall or building somewhere. The rope weighs 1/3 lb. per ft.. How much work is done in pulling it all up to the top of the wall

8. Averages. Find the average value of the function $y = \sin x$ on the interval $[0, \pi/3]$