Practice Problems for the Final

The final takes place Saturday, March 10 from 3 to 6 pm in Kemeny 008. The exam will be cumulative and will cover sections 4.4, 4.7, 4.9, 5.1-5.5, 6.1-6.3, 7.1-7.3, 7.8 in your textbook. The format will be similar to the previous two midterms.

You should know:

1. relevant definitions and theorems (Riemann sums definition of the integral, Fundamental Theorem of Calculus, l'Hôpital's rule).
2. how to do an optimization problem OR how to do an "antiderivatives problem" involving acceleration, velocity, and position.
3. how to compute integrals using methods including u-substitution, integration by parts, trig integrals, trig substitution.
4. how to compute area between curves and volumes of solids (using both disk/washer method and cylindrical shells).
5. how to evaluate an improper integral (convergent/divergent).
6. how to compute the following integrals:
   (a) $\int \sin(x)\,dx$
   (b) $\int \cos(x)\,dx$
   (c) $\int e^{-x}\,dx$
   (d) $\int x^n\,dx$
   (e) $\int \sec^2(x)\,dx$
   (f) $\int \sec(x)\tan(x)\,dx$
   (g) $\int \ln(x)\,dx$
   (h) $\int x\sin(x)\,dx$
   (i) $\int x\cos(x)\,dx$

(j) $\int xe^x\,dx$

(k) $\int \tan(x)\,dx$

(l) $\int \cot(x)\,dx$

(m) $\int x\ln(x)\,dx$

(n) $\int \frac{\ln(x)}{x}\,dx$

(o) $\int \sin^3(x)\,dx$

(p) $\int \cos^3(x)\,dx$

(q) $\int_0^1 \frac{1}{x}\,dx$

(r) $\int_1^\infty \frac{1}{x}\,dx$

(s) $\int_0^1 \frac{1}{x^2}\,dx$

(t) $\int_1^\infty \frac{1}{x^2}\,dx$

7. how to prove:
   (a) $\int \frac{1}{1+x^2}\,dx = \arctan(x) + c$ (using trig substitution).
   (b) $\int \frac{1}{\sqrt{1-x^2}}\,dx = \arcsin(x) + c$ (using trig substitution).
8. how to do the problems from quizzes 1, 3, 5, 6, 7, 8. (solutions on our webpage)
9. how to do relevant problems from the first two midterms
10. how to do the following problems from the book: 4.4.19, 4.7.13, 4.7.16, 4.9.75, 4.9.76. 5.3.1, 5.3.8, 5.5.14 (you can also try trig sub here), 6.1.13, 6.1.14, 6.2.4 (rotate about both the x-axis and y-axis), 7.1.37 (yes, this was on your homework), 7.1.38, 7.3.3, 7.3.17.

If you still feel underprepared after doing all of these problems, you can browse final exams found on old Math 2 webpages.

As always, don't forget to write "dx" and "$+C$"!!! (why is this important?)