Math 152, Fall, 2004, Workshop 4

Honors Section

1. Calculate each of the indefinite integrals (these are all pretty easy):

   (a) $\int \sec^4 x dx$.

   (b) $\int \sec^3 x \tan x dx$.

   (c) $\int \sec^2 x \tan^2 x dx$.

   (d) $\int \sec x \tan^3 x dx$.

2. Calculate the area which lies inside both of the ellipses $\frac{x^2}{3} + y^2 = 1$ and $x^2 + \frac{y^2}{3} = 1$

3. The region R is bounded below by the x-axis, bounded on the left by the line $x = 0$, bounded on the right by the line $x = 2$, and bounded above by the curve
$$y = \frac{2x+1}{x^2+3x+2}.$$

   (a) Sketch the region R and set up a definite integral that gives the area of R. Then calculate the integral using the method of partial fractions.

   (b) The region R is rotated around the x-axis to generate a solid body B. Sketch B and, by slicing B into discs, set up a definite integral that gives the volume of B. Calculate the integral using the method of partial fractions. (warning: there are four undetermined coefficients).

4. Many integrals can be done with "rationalizing substitutions" which change the integrals into integrals involving rational functions. In turn, these integrals can be computed (at least theoretically) using partial

fractions, although often it is simpler to integrate directly or to use a trigonometric substitution. Integrate:

$$\int \frac{1}{x+\sqrt{x}}dx$$

(try $x = t^2$) and

$$\int \frac{1}{e^{2x}+1}dx$$

(try $t = e^x$).