Math 104, Lecture 2 Problem Set 4 Spring 2011

Due the week of February 7, 2011, in recitation.

Reminders: 1. Exam #1 will be held in class on Monday, Feb. 7. It will cover the material up through section 8.2, including the review material.

2. Extra credit will be given to those who hand in Sample Exam 1 before the exam (consult your TA about when and where to submit it).

Read Stewart, sections 8.2 and 8.3. For each of these two sections, work through the first four core problems, but do not hand them in.

The problems below are to be handed in.

Part A: Do the following problems from Stewart:

Section 8.1, page 493: exercises 2, 5, 6, 7.
Section 8.2, pages 501-502: exercises 4, 6, 11, 61.
Section 8.3, page 508: exercises 5, 9, 33.

Part B: Do the following problems:

1. Find the volume of the solid of revolution obtained by rotating the graph of $y = \ln(x)$, between $x = 1$ and $x = e$, about the x-axis.

2. Find the average value of the function $\sin^2(x)\cos^2(x)$ between $x = 0$ and $x = \pi$.

3. Let f be a differentiable function such that $f(x) \geq 0$ for all x, and $f(2) = 0$. Suppose that the area under the graph of $y = f(x)$, between $x = 0$ and $x = 2$, is 3. Using integration by parts, find the value of $\displaystyle\int_0^2 xf'(x)dx$.

4. Consider the region that is bounded above by the circle $x^2 + y^2 = 1$ and below by the x-axis, between $x = \sqrt{2}/2$ and $x = 1$. Evaluate this in two ways:

(i) By using trigonometric substitution to evaluate an integral.

(ii) By finding the area of the sector of the circle bounded below by the x-axis and above by the line $y = x$ and by the circle; and then subtracting the area of the right triangle with vertices $(0, 0)$, $(\sqrt{2}/2, 0)$, and $(\sqrt{2}/2, \sqrt{2}/2)$. (Draw a picture to relate these areas to that of the region being considered.)

5. Evaluate $\displaystyle\lim_{t\to 0} \frac{1}{t}\int_0^t \cos^6(x)dx$. [Hint: This can be done without evaluating the integral.]