Math 142, Exam 2, Fall 2006

Write your answers as legibly as you can on the blank sheets of paper provided.

Please leave room in the upper left corner for the staple.

Use only **one side** of each sheet. Be sure to number your pages. Put your solution to problem 1 first, and then your solution to number 2, etc.; although, by using enough paper, you can do the problems in any order that suits you.

The exam is worth a total of 100 points. There are 10 problems. Each problem is worth 10 points.

SHOW your work. $\boxed{CIRCLE}$ your answer. **CHECK** your answer whenever possible. **No Calculators or Cell phones.**

I will post the solutions on my website sometime this afternoon.

If I know your e-mail address, I will e-mail your grade to you as soon as the exam is graded. If I don't already know your e-mail address and you want me to know it, then **send me an e-mail**.

1. Define the definite integral. Give a complete definition. Be sure to explain all of your notation.

2. Find $\displaystyle\int xe^x\,dx$. **Check your answer.**

3. Find $\displaystyle\int \frac{dx}{\sqrt{1+x^2}}$. **Check your answer.**

4. Find $\displaystyle\int \frac{xdx}{\sqrt{1+x^2}}$. **Check your answer.**

5. Find $\displaystyle\int \sin^5 x\,dx$. **Check your answer.**

6. Find $\displaystyle\int \sin^2 2x\,dx$.

7. Find the area between $x = y^2$ and $8 = x + 2y$. (There is no need for you to do arithmetic. Leave your answer in terms of sums and products of numbers.)

8. Find the length of the curve
$$\begin{cases} x = \frac{1}{3}t^3 \\ y = \frac{1}{2}t^2, \end{cases}$$
for $0 \le t \le 1$.

9. Find the volume of the solid whose base is the region bounded between the curves $y = x$ and $y = x^2$, and whose cross sections perpendicular to the x-axis are **equilateral triangles**. There is no revolution in this problem.

10. The vat shown in the accompanying figure contains water to a depth of 2 m. Find the work required to pump all the water to the top of the vat. [Use 9810 N/m^3 as the weight density of water.] (There is no need for you to do arithmetic. Leave your answer in terms of sums and products of numbers.) Be sure to give the correct units.