APPM 1350 EXAM #3 Spring 1997

ON THE FRONT OF YOUR BLUEBOOK write: (1) your name, (2) your student ID number, (3) lecture section (4) your instructor's name, and (5) a grading table. You must work all of the problems on the exam. Show ALL of your work in your bluebook and **BOX IN YOUR FINAL ANSWERS**. A correct answer with no relevant work may receive no credit, while an incorrect answer accompanied by some correct work may receive partial credit. Text books, class notes, crib sheets, and calculators are NOT permitted.

1. (15 points) For each statement, if it is true, give a reason why it is true. If it is false, either give a reason why it is false, or give a counter example showing that it is false.

   (a) $\int f'(x)\, g'(x)\, dx = f(x)g(x) + C$

   (b) $\int (2x+1) f'(x + x^2)\, dx = f(x + x^2) + C$

   (c) $\displaystyle\int_a^b (f(x))^2\, dx = \left(\int_a^b f(x)\, dx \right)^2$

2. (20 points) Consider the function $f(x)$ defined as $f(x) = \displaystyle\int_0^x t(1-t)\, dt$.

   (a) Find the value of x that maximizes $f(x)$.

   (b) Draw the graph of $t(1-t)$ and explain your result.

3. (20 points) Consider the triangular region shown in figure (a). Now assume that this region is revolved about the y-axis to give the volume shown in figure (b). Calculate the volume of this solid of revolution.

4. (15 points) Consider the function $f(x) = \sin^2 2x$.

   (a) Calculate the average value of $f(x)$ over the interval $\left[0, \dfrac{\pi}{2}\right]$.

   (b) Which calculus result assures us that there is a point c at which $f(c)$ is equal to the average value determined in part (a)?

   (c) What is the value of c?

5. (15 points) Use Riemann sums to show that $\displaystyle\int_a^b c\, dx = c(b-a)$.

6. (15 points)

   (a) Write down the general formula for the trapezoidal rule to approximate the integral $\displaystyle\int_a^b f(x)\, dx$.

   (b) Now consider the particular integral $\displaystyle\int_0^\pi \sin x\, dx$. Use 4 intervals and write out the resulting formula. *Do not evaluate this expression.*

   (c) Draw a figure to illustrate the calculations done in part (b).