APPM 1350 FORGIVENESS EXAM #3 Fall 2001

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. (20 points) Perform the following calculations.

   a. Evaluate $\displaystyle\int_0^{\tan x} \sec^2 y \, dy$.

   b. Evaluate $\displaystyle\int_0^{\pi^{1/3}} x^2 \cos(x^3)\sqrt{\sin(x^3)}\, dx$.

   c. Find $f(4)$ if $\displaystyle\int_0^{f(x)} t^2 \, dt = x\sin(\pi x)$.

   d. Find $f(4)$ if $\displaystyle\int_0^{x^2} f(t) \, dt = x\sin(\pi x)$.

2. (20 points)

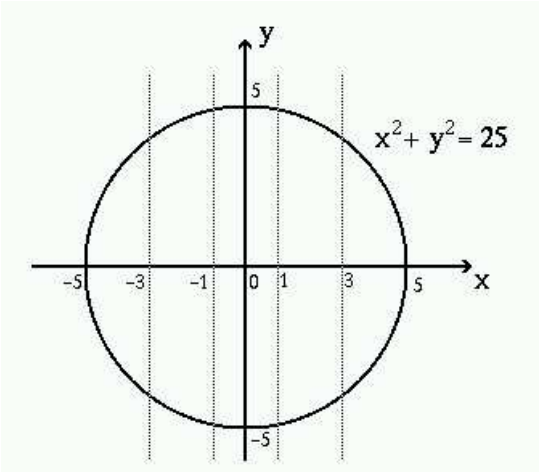
   a. Write down the general formula for Newton's method.

   b. Use Newton's method to find $\sqrt[4]{2}$ by solving the equation $[x^4 - 2 = 0]$. Start with $x_0 = 1$, and find x_1. Find an explicit (but complicated) expression for x_2. You need not simplify this expression, but state whether $x_2 < x_1$, $x_2 > x_1$, or $x_2 = x_1$.

3. (20 points) To estimate the volume V of a solid sphere of radius 5, you partition its diameter into five subintervals of length 2. You then slice the sphere with planes perpendicular to the diameter at the subintervals' **left-hand endpoints** and add the volumes of cylinders of height 2 based on the cross sections of the sphere determined by these planes.

   a. Find the sum S_5 of the volumes of the cylinders.

   b. Express $|V - S_5|$ as a percentage of V to the nearest percent. (Hint: The volume of a sphere is given by $V = \frac{4}{3}\pi r^3$.)



HEY, THERE'S MORE—TURN THE PAGE OVER!

4. (20 points) A motorcycle safety program requires riders to be able to brake from 50 ft/sec to 0 in 50 ft. The deceleration while braking is a constant, k.

   a. Find the time, t_{final}, for the motorcycle to stop. Your answer will depend on k.

   b. What value of k make the stopping distance 50ft. Include the correct units.

5. (20 points) For each part below, write either True or False. If it is **always** true, either give a reason why it is true, or give an example where 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. $\int f'(g(x))\,dx = f(g(x)) + C$

   b. $\int (3x^2+1)h'(x+x^3)\,dx = h(x+x^3) + C$

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

   d. $\int_{-a}^{a} f(x)\,dx = 0$ if $f(x)$ is an odd function and $f(x)$ is integrable.

Is this information written clearly on the front of your bluebook:

- Your name?
- Your instructors name?
- Forgiveness exam #3?