APPM 1350 EXAM #3 Spring 2003

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. (30 points) Evaluate the following integrals.

   (a) $\displaystyle\int (\sqrt{x} + \sqrt[3]{x}\,)\, dx$ (b) $\displaystyle\int x \cot(x^2)\, dx$

   (c) $\displaystyle\int \sin^2\left(\frac{x}{2}\right)\, dx$ (d) $\displaystyle\int_1^e \frac{\sqrt{\ln x}}{x} dx$

   (e) $\displaystyle\int_0^{\sqrt{2}} x\, 4^{x^2}\, dx$ (f) $\displaystyle\int \frac{t+2}{t^2+4t}\, dt$

2. (15 points) Calculate $\dfrac{dy}{dx}$ for each of the following (fully simplify your answer):

   (a) $y = \ln(e^x)$ (b) $y = x^{\ln x}$

   (c) $\displaystyle y = \int_{e^x}^{\pi} t \ln(t)\, dt$

3. (20 points) Suppose we wish to estimate the value of $\ln(3) = \displaystyle\int_1^3 \frac{1}{t}\, dt$ by numerical integration

   (a) Use the Trapezoid Rule with n=2 to get an estimate of ln(3).

   (b) The error estimate for the Trapezoid Rule is given by $|E_T| \leq \dfrac{b-a}{12} h^2 M$. How many subintervals would be needed to compute ln(3) with an error at most $\dfrac{1}{12}$ using the Trapezoid Rule?

4. (15 points) Suppose the amount of candy in the candy jar decreases at the continuous rate of 10% per day. When will the amount of candy fall to one-fifth of its present value?

COOL, THERE'S MORE!! TURN THE PAGE OVER

5. (20 points) Multiple Choice (no justification needed for this problem)

(a) The expression $3e^{2\ln(x)}$ can be simplified to the form

(i) $3x^2$ (ii) $6x$ (iii) $3\ln(x)e^2$ (iv) 3

(b) Estimating the value of $\int_0^1 x^2 dx$ with the Trapezoid Rule will give an answer: (note: the value of the integral is exactly $\frac{1}{3}$)

(i) $< \dfrac{1}{3}$ (ii) $> \dfrac{1}{3}$ (iii) $= \dfrac{1}{3}$ (iv) None of the above

(c) If $I = \int_0^{\frac{\pi}{2}} \sqrt{\sin(x)}dx$ and we know $\sin(x) \leq \sqrt{\sin(x)} \leq 1$ on $[0, \dfrac{\pi}{2}]$ then we know

(i) $1 \leq I \leq \dfrac{\pi}{2}$ (ii) $\dfrac{\pi}{2} \leq I \leq 1$ (iii) $-1 \leq I \leq 1$ (iv) $\dfrac{\pi}{4} \leq I \leq 1$

(d) The domain of the function $f(x) = ln(x^2 - 1)$ is

(i) $(-1, 1)$ (ii) $(-\infty, \infty)$ (iii) $(-\infty, -1) \cup (1, \infty)$ (iv) $(0, \infty)$

(e) $\displaystyle\sum_{k=1}^{3} \frac{k}{k^2+1}$ is equal to:

(i) 13/12 (ii) 4/5 (iii) 23/12 (iv) 6/5