APPM 1350 EXAM 3 FALL 2006

INSTRUCTIONS: Books, notes, flying monkeys and electronic devices are not permitted. Write your (1) name, (2) instructor's name, and (3) recitation section on the front of your bluebook. Also make a scoring table, with places for 5 problems, plus a total score. This exam has 5 problems, on both sides of this sheet. Work all **5 problems**. Start each problem on a **new page**. Show you work. Box in your answers. A correct answer with incorrect or no supporting work may receive no credit, while an incorrect answer with relevant work may receive partial credit.

1. (20 points) Consider f(x) = $2x - x^2$ on the interval [0,3]
a) Sketch the graph of the curve y = f(x).
b) What is the average value of f(x) = $2x - x^2$ on [0,3]?
c) At what value or values of x in [0,3] is the average value of f(x) attained?

2. (20 points)
a) State BOTH PARTS of the Fundamental Theorem of Calculus completely, including the hypotheses.
b) Suppose $\int_0^x f(t)dt = \sin x$. Find f(x).

3. (20 points) Evaluate the following:
a) $\int_1^4 \frac{1}{\sqrt{x\sqrt{1+\sqrt{x}}}}dx$
b) $\frac{d}{dx}\int_1^{x^2} \sec(t-1)dt$

4. (20 points) a) Find $f^{-1}(x)$ when f(x) = $x^2 - 2x + 1,\ x \ge 1$
c) What are the domain and range of the $f^{-1}(x)$ found in part (a)?
d) Find y' when y = $\frac{\ln x}{1+\ln x}$. Simplify your answer.

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5. (20 points) Consider f(x) = $3x^2$ and a partition of the interval [0,1] into 2 subintervals of equal length.

a) Using left hand endpoints of each subinterval to evaluate f, approximate $\int_0^1 3x^2 dx$ by the Riemann sum, R = $\sum_{k=1}^{n} f(c_k)\Delta x$

b) Use the Trapezoidal Rule , T = $\frac{h}{2}\left(y_o + 2[y_1 + y_2 + \ldots + y_{n-1}] + y_n\right)$ with the same two subintervals to approximate $\int_0^1 3x^2 dx$

c) Is R or T a better estimate of $\int_0^1 3x^2 dx$? Explain.

d) What is the smallest number of subintervals of [0,1] that would be enough to be sure that the trapezoidal rule for f(x) = $3x^2$ would have an error less than or equal to 0.5 x 10^{-4}, given that $|E_T| \le \frac{b-a}{12} h^2 M$?