APPM 1350 Midterm #3 Makeup Fall 2009

At the top of your bluebook, in BOLD letters, write EXAM 3 MAKEUP. On the front of your bluebook, please write: a grading key, your name, student ID, and section and instructor. This exam is worth 100 points and has ?? questions.

- **Show all work!** Answers with no justification will receive no points.
- Please begin each problem on a new page.
- No notes, calculators, or electronic devices are permitted.

1. (21 points) Evaluate the following integrals. Show all work.

   (a) $\displaystyle\int \frac{\sec^2(\sqrt{x}+1)}{\sqrt{x}}\,dx$

   (b) $\displaystyle\int_0^1 \frac{1}{\sqrt[3]{8-7x}}\,dx$

   (c) $\displaystyle\int_0^{\pi/4} \frac{\sin(x)}{\cos^2(x)}\,dx$

2. (28 points) Answer the following questions. Show your work.

   (a) Carefully state the Fundamental Theorem of Calculus, parts 1 and 2. Be sure to include the hypotheses of the theorem in your answer.

   (b) If $F(x) = \displaystyle\int_1^{x^2} \frac{1}{t}\,dt$, find $F'(7)$.

   (c) Evaluate $lim_{n\to\infty} \displaystyle\sum_{k=1}^{n}(1+\frac{9k^2}{n^2})\frac{1}{n}$. (Hint: A definite integral $\displaystyle\int_0^1 f(x)\,dx$ is approximated by Riemann sums, using the right-hand endpoints of the subintervals. Find the function $f(x)$ corresponding to the Riemann sum $\displaystyle\sum_{k=1}^{n}(1+\frac{9k^2}{n^2})\frac{1}{n}$ and use this to evaluate the limit.)

   (d) Consider the integral $\displaystyle\int_0^2 \sin(x^2)\,dx$. Partition the interval $[0,2]$ into n subintervals of equal length. Write down the Riemann sum of the integral using right hand endpoints.

3. (20 points) The driver of a car going $100 ft/sec$ slams on the brakes, producing a constant decelleration of $20 ft/sec^2$. In answering the following questions, please use the correct units.

   (a) How much time does it take for the car to stop?

   (b) How far does the car travel before it stops?

4. (16 points) Suppose $f(x) = \ln(x-3)$.

   (a) What is the domain and range of $f(x)$?

   (b) Show that the function $f(x) = \ln(x-3)$ is invertible.

   (c) Find the inverse $f^{-1}(x)$.

   (d) What is the domain and range for $f^{-1}(x)$?

5. (15 points) Let $g(x) = x^2 + \displaystyle\int_{3x}^{-3} \frac{1}{t^2+2}\,dt$

   (a) Find the linearization of $g(x)$ at $x = -1$.

   (b) Use part (a) to approximate $g(-1.1)$.