APPM 1360 EXAM 1 Fall 2005

ON THE FRONT OF YOUR BLUEBOOKS WRITE: (1) your name, (2) your student ID number, (3) lecture section, (4) instructor's name and (5) a grading table. Write all of your work in your bluebook and box your final answer. A correct answer with no supporting work may receive zero credit, while an incorrect answer with supporting work may receive partial credit. Only one 8.5×11 formula-sheet is permitted. Use of calculators, class notes, any calculus book, etc. is not permitted.

1. (*36 points, 6 each*): Evaluate; simplify answers as appropriate:

(a) $\frac{d}{dx}e^{\ln(2x)}$	(d) $\int e^{kx}dx; k = constant$
(b) $\frac{d}{dt}[t^2 \ \ln(1/t)]$	(e) $\int_e^{e^2} \frac{1}{xlnx}dx$
(c) $\frac{d}{dx}(\sinh^2 x + \cosh^2 x)$	(f) $\int_{\frac{\pi}{2}}^{\pi} \sqrt{1 - \sin^2(\theta)}\, d\theta$

2. (*24 points, 8 each*): Consider the region enclosed between $y = x$ and $y = x^2$. Set up, but **DO NOT** evaluate, the resulting integrals.

(a) Find the enclosed area.

(b) Revolve the region around the $y-$axis. Use washers to find the volume.

(c) Use shells to find the volume in part (b) above.

3. (*8 points*): Find the length of the curve $y(x) = \int_{-2}^{x} \sqrt{9t^4 - 1}\, dt$, $-2 \leq x \leq -1$.

4. (*12 points*): Set up the integral as indicated below. **DO NOT** evaluate the resulting integral. Determine the center of mass of a thin plate of constant density in the form of a circle $x^2 + y^2 = 1$ in the first quadrant ($x \geq 0, y \geq 0$).

5. (*12 points, 6 each*): Consider the following differential equation: $\frac{dy}{dx} = \frac{y}{x} + k$, $k = constant$.

(a) Find the general solution when $k = 0$.

(b) When $k \neq 0$ find the solution to the equation that also satisfies the condition $y(1) = 0$.

6. (*8 points*): The function $y = tanh^{-1}x$ for $|x| < 1$ can be written in terms of the natural logarithm function. *Derive* this relationship.