Math 125
Final Exam
August 16th, 2007

Name: ______________________________

1. Your exam contains 5 questions and 6 pages; Please make sure you have a complete exam.
2. The in-class portion of the exam is worth 88 points. The take-home portion of the exam will be added to account for a 100 point exam. Point values for problems on the exam vary and are indicated. You have 75 minutes for this exam.
3. Make sure to ALWAYS SHOW YOUR WORK; you will not receive any partial credit unless all work is clearly shown. If in doubt, ask for clarification. Note: To evaluate limits, proof by graph or table of values does not suffice for full credit.
4. If you need extra space, attach an extra sheet to the back of the exam and clearly indicate this.
5. You are allowed one 8.5×11 sheet of handwritten notes (both sides). Graphing and scientific calculators are allowed.
6. Leave answers in exact form or round to 4 decimal places.

Problem	Total Points	Score
1	18	
2	22	
3	10	
4	24	
5	14	
Total	88	

1. (18 pts.) Evaluate the following limits using l'Hospital's Rule where appropriate. Be sure to justify your answers.

   (a) (9 pts.) $\lim_{x \to \infty} \frac{(\ln x)^2}{x}$

   (b) (9 pts.) $\lim_{t \to 0^+} (\cos t)^{1/t}$

2. (22 pts.)

(a) (10 pts.) Approximate the area under the curve of $h(x) = \arctan 2x$ from $x = 0$ to $x = \frac{1}{2}$ using Simpson's Rule with $n = 4$. Give your answer rounded to 4 decimal places.

(b) (12 pts.) Find the exact area using integrals.

3. (10 pts.) Consider $g(x) = \int_0^x e^t \sin(t)\, dt$. Find **all** values of $b > 0$ such that $g'(b) = 0$.

4. (24 pts.) Evaluate each integral or show that it is divergent. Be sure to justify your answers.

(a) (12 pts.) $\displaystyle\int_0^1 \frac{2e^x}{e^x - 1}\, dx$

(b) (12 pts.) $\displaystyle\int_1^\infty \frac{-2x-3}{x^3+2x^2+x}\,dx$ (Recall: $\ln a - \ln b = \ln \frac{a}{b}$)

5. (14 pts.) The velocity of an annoying mechanical barking dog moving along a straight line is given by the function $v(t) = \frac{2t+4}{\sqrt{t+9}}$ in meters/minute at minute t. Find the function $s(t)$ that gives the position of the annoying mechanical barking dog if the initial position of the dog is 2 meters.