Math 126: Calculus II Name:_____
Exam I *September 28, 2000* Instructor:_____

There are 6 problems on 6 pages worth a total of 84 points. You start with 16 points. Each part of a problem is worth the same number of points.

You may use a calculator if you wish.

To receive partial credit on a problem, you must *show your work and all important steps.* No credit will be given for an answer if no work is shown.

1. (18 pts) Find the derivatives.

   a) Let $f(x) = x \ln x$. Find the value of $(f^{-1})'(2e^2)$. [Hint: $f(e^2) = 2e^2$.]

   b) $\dfrac{d}{dx} \cos^{-1}(x^{-1})$.

   c) $\dfrac{d}{dx} x^{\cosh(x)}$.

Name:_____

2. (18 pts) Compute the integrals.

a) $\int e^x \sin(1+e^x)dx.$

b) $\int_0^1 \frac{x}{1+x^4}\,dx$

c) $\int \frac{x}{x+1}\,dx$

Name:_____

3. (12 pts) Compute the limits.

a) $\lim_{x \to 0} \dfrac{\sin^{-1}(x)}{x}$

b) $\lim_{x \to 0^+} e^{-1/x} \ln(x)$

Name:_____

4. (12 pts) In each part of this problem you are presented with two functions $f(x)$ and $g(x)$ and you are to decide which of the following three possibilities holds as $x \to \infty$.

   i) $g(x)$ grows faster than $f(x)$.

   ii) $f(x)$ grows faster than $g(x)$.

   iii) $f(x)$ and $g(x)$ grow at the same rate.

   Write the answer as i), ii), or iii). As always, you must show all work justifying your answer.

   a) $f(x) = \dfrac{1}{x}$ and $g(x) = \sin(\tan^{-1}(x))$.

   Ans. a) _____

   b) $f(x) = \sinh(\ln(x))$ and $g(x) = x$.

   Ans. b) _____

Name:_____

5. (12 pts) Warfarin is a drug used as an anticoagulant. After administration of the drug ends, the quantity remaining in a patient's body decreases at a rate proportional to the quantity remaining. The half-life of Warfarin in the body is 37 hours. How many days does it take for the drug level in the body to be reduced to 10% of the original level.

Name:_____

6. (12 pts)

a) Solve the differential equation $xy' + 2y = x$.

b) Solve the initial value problem $x^2y' = y, \quad y(1) = 1$.