MIDTERM 2
Calculus 140, Fall 2005
Hunsicker

Notes: Remember that this exam is a form of communication between you and me. The more clearly you communicate, the better I can see you understand things. Thus, show all work, explain what you are doing, and write clearly. You may use a calculator on this exam, but **only for numerical calculations**. No other aids are permitted, such as notes, books or friends. This is a two hour exam and 100 points are possible. Please allot your time accordingly.

Theory

1) (10 points) Define and explain marginal cost.
2) (5 points) Define inverse function.
3) (10 points) a) What is the limit below?

$$\lim_{x\to 0}\frac{\sin(x)}{x}$$

b) Use this to find the following limit. Show all work:

$$\lim_{x\to 0}\frac{\sin(5x)}{3x}$$

Word Problems

4) (10) Find the equation of the tangent line at (1,2) to the graph of the function $f(x)=3x^2-2x+\sqrt{x}$

5) (20 points) Suppose a ball is thrown into the air so that its height at time t is given by $h(t)=-16t^2+8t+8$.

a) What is the ball's velocity at time t? Acceleration?
b) When does it reach its maximum height?
c) What is its maximum height?
d) How fast does it hit the ground?

Calculations

6) (5 points) Find $f'(x)$ for $f(x)=x^2e^x$.
7) (10 points) Find

$$\frac{d^2}{dx^2}[\arctan(x)]$$

8) (10 points) If f (t) = tan (1/t), find f '(t). Then, without a calculator, find f '(3/4π).
9) (10 points) Use implicit differentiation to find dy/dx if $3xy^2=x^2-\cos(y)$.

10) (10 points) Find the following derivative (hint: use log rules first to simplify!)

$$\frac{d}{dx}\left[\ln\sqrt{\frac{e^x}{\sec(x)}}\right]$$