Name		

Student ID # \_\_\_\_\_

Class (circle one) 9:40 10:45

Math 1210 Fall 2004 K. M. Golden

## EXAM II

Friday, October 22, 2004

Problem	Points	Score
1.	20	
2.	20	
3.	15	
4.	20	
5.	10	
6.	15	
	TOTAL	

(20 points) 1. Calculate the following. Be sure to show all of your work.

(a) 
$$\frac{d}{dx}\left(x\sin^2 x\right)$$

(b) the differential 
$$dm$$
 of  $m(v)$ , where  $m(v) = \frac{m_0}{\sqrt{1 - v^2/c^2}}$ 

(c) 
$$\frac{d}{dx}\left(\frac{1-x}{1+x^2}\right)$$

(d) 
$$\lim_{x \to 0} \frac{1 - \cos x}{x}$$

(20 points) 2. Consider  $f(x) = x^2 - 4x + 3$  on the interval [0, 3].

(a) Find where f is increasing and decreasing.

(b) Find the maximum value of f(x) on [0,3] and find the minimum value of f(x) on [0,3]. Be sure to justify your answers.

(c) Find where f is concave up and where it is concave down. Does f(x) have any inflection points on [0, 3]?

(d) Sketch the graph of f(x) on [0,3], incorporating all your information from (a)–(c).

(15 points) 3. Find the dimensions of the rectangle with maximum area inscribed in a circle of unit radius. Be sure to show all your work. (20 points) 4. A primordial lightning bolt ignites a flame in the top of a 100 foot tall Cretaceous tree. A *tyrannosaurus rex*, who is 20 feet tall, runs away from the flame at a speed of 10 f/s. How fast is the length of his shadow moving when he is 250 feet away from the base of the tree?

(10 points) 5. Use linear approximation (the differential) to estimate  $\sqrt{24}$ .

(15 points) 6. Most of the gases in earth's atmosphere are contained in the first 20 miles of altitude above the surface of the earth. The radius of the earth is about 4,000 miles. Use the differential to estimate the volume (in cubic miles) of this main part of our atmosphere.