Math 205 Exam 2

Tuesday June 27, 2006

Instructor:_____ **Class Time:**_____ **Name:**_____

No books or notes are allowed. Please read the problems carefully and do **all** you are asked to do. **You must show your work!** You can use the back page as a scratch paper. Do the problems at the space provided.

Total/100	#1	#2	#3	#4	#5	#6	#7	#8

1(total points: 12). Use the following graph of a given function $f(t)$:

(a)**(6 points).** Estimate the intervals on which $f'(t) > 0$ and the intervals on which $f'(t) < 0$.

(b) **(6 points).** Estimate the intervals on which $f''(t) > 0$ and the intervals on which $f''(t) < 0$.

2 (total points: 12 points). Assume that $h(t) = 2^t$.

(a) **(7 points).** Use average rate of change over the interval $2.99 \leq t \leq 3.01$ to estimate $h'(3)$.

(b) **(5 points).** Use part (a) to estimate $h(3.1)$.

3 (total points: 14). Differentiate

(a) **(4 points).** $f(x) = \sqrt{5} + 5\sqrt{x} + \dfrac{5}{x}$

(b) **(4 points).** $g(u) = \ln u - e^u + 5(3^u)$

(c)**(6 points).** $y = \dfrac{x^2}{x+1}$ (Simplify your answer).

4 (total points: 12).

(a)**(4 points).** Find the derivative of $f(x) = (1 + 3x)^{2006}$.

(b) **(4 points).** Find the derivative of $f(x) = \ln(1 + x^3)$.

(c) **(4 points).** Find the derivative of $f(x) = 5e^{-0.2x}$.

5 (total points: 13). Cost and revenue functions for a company are shown in the following figure.

(a) **(7 points).** If the current production level is 500 items, should the company produce the 501st item?

(b) **(6 points).** Estimate the quantity which maximizes profit.

6 (total points: 12). The following table gives the cost and revenue, in dollars, for different production levels, q.

q	0	100	200	300	400	500
R(q)	0	500	1000	1500	2000	2500
C(q)	700	900	1000	1100	1300	1900

(a) **(4 points).** At approximately what production level is profit maximized?

(b) **(4 points).** What price is charged per unit for this product?

(c) **(4 points).** What are the fixed costs of production?

7 (total points: 12). Find the equation of the tangent line to the graph of $f(x) = xe^x$ at $x = \ln 5$.

8 (total points: 13). The following table shows $P(t)$, total population (number of people) of a town as a function of t.

Year, t	1996	1998	2000	2002
Number of people, $P(t)$	10028	10089	10140	10195

(a) **(7 points).** Estimate $P'(2002)$. Give units with your answer and interpret your answer.

(b) **(6 points).** Use the results of part (a) to estimate $P(2005)$. Interpret your answer.