Name(Print) ____________________ Lecture Time____________________

Signature ____________________ Instructor____________________

General Calculus - MATH 205, Fall 2007
Exam I, Fall 2007

page	1	2	3	4	5	6	7	8	9	10	Total
points											

1. Show the details of your work under each question. 2. Clearly label your answer and your exposition may have effect on grading. 3. Each problem is worth 10 points.

1. Find the equation of the straight line that passes through the points

$$(1, 2),\ (3, -4).$$

In addition, write down the slope and the y-intercept.

2. A company has cost and revenue functions, in dollars, given by $C(q) = 1000 + 8q$, and $R(q) = 12q$.

(a) Find out whether the company makes a profit if it produces 500 units.

(b) Find the break-even point

(c) Illustrate the break-even point in graph.

3. The population of a town is 1000 at time $t = 0$.

(a) Write a formula for the population, P, as a function of year t if the population increases by 75 people a year.

(b) Write a formula for the population, P, as a function of year t if the population increases by 5% a year. (Hint: it is an exponential function of the form $P = P_0 a^t$.)

(c) Rewrite the formula in part (b) in the form of $P = P_0 e^{kt}$.

(d) Using the formula from part (b), estimate the population after 10 years.

4. A cup of coffee contains 150 mg of caffeine, which leaves the body at a continuous rate of 15% per hour.

(a) Write a formula for the amount, A mg, of caffeine in the body t hours after drinking a cup of coffee.

(b) Graph the function from part (a). Use the graph to estimate the half-time of caffeine.

(c) use logarithm to find the half-time of caffeine.

5. (a) For $f(x) = 2x^2 - 3x$, find and simplify $f(2+h) - f(2)$.

(b) for $f(x) = \sqrt{x+2}$, $g(x) = x^2 + 2$, find $f(g(x)$ and $g(f(1))$.

6. A health club has cost and revenue functions given by $C = 10000 + 35q$ and $R = pq$, where q is the number of annual club members and p is the price of a one-year membership. The demand function for the club is $q = 3000 - 20p$.

(a) Write the cost and revenue as functions of p.

(b) Graph the cost and revenue as functions of p on the same axes.

(c) For what prices does the club make a profit?

(d) Estimate the annual membership fee that maximizes the profit.

7. (a) A bank pays a CD rate of 6.25% compounded continuous. How long does it take the balance to double?

(b) If you want to double the balance of a CD in 10 years, what the rate needs to be?

8. (a) Find the derivative of the $f(x) = \ln x$ at $x = 3$.

(b) For a given function $f(x)$ satisfying $f(12) = 34$ and $f'(12) = 5.6$, estimate $f(12)$ and $f(14)$ by local linear approximation.

9. The following is the graph of the position function of a particle at time t. At which point of the marked values of t can the following statement be true?

   a the position is positive: ____________________

   b the velocity is positive: ____________________

   c the acceleration is positive: ____________________

   d the position is decreasing: ____________________

   e the velocity is decreasing: ____________________

10. (a) The following is the graph of $f(x)$. Graph $2f(x) - 1$.

(b) Find the derivatives of the following three functions

A________________ B________________ C________________

by choosing from the following graphs of derivatives: