MATH 205 EXAM 3

7:30—8:30 pm, Thursday November 9, 2006

Instructor's Name:____________________ **Name:**__________________________

No books or formula sheets are allowed. Use the back page as a sketch paper. For full credit, show your work in detail.

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

1 (12 pts). The values of the derivative of a function are given in the following table:

x	0	1	2	3	4	5	6	7	8	9	10
$f'(x)$	9	7	3	-1	-2	1	4	8	7	5	-2

a Estimate all critical points

b . Indicate each of them as a local minimum or a local maximum.

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2 (13pts). Find all critical points of $f(x) = x^3 - 3x^2 - 9x + 15$ and identify each as local minima or local maxima of function f.

3 (12pts). Find all inflection points of $f(x) = x^4 + x^3 - 3x^2 + 2$.

4. (13pts). For $f(x) = 3\ln x - x$, and $1 \leq x \leq 5$, find global minimal and global maximal values of $f(x)$, and at where they are reached.

5 (13pts). The Cost function of producing q items is given by: $C(q) = q^3 - 12q^2 + 60q$.

- a. (5 pts). At which value q is the average cost $a(q)$ minimal ?

- b, (3 pts). If ecah item is sold for \$24,find the profit function $P(q)$.

- c. (5 pts). At which value of q is the profit $P(q)$ maximum ?

6 (12 pts). The percentage, P, of houshold s with cell phones since $t = 1992$ in a certaing county is modeled by

$$P(t) = \frac{85}{1 + 3.5e^{-0.13t}}.$$

- a. (3pts). What is the limiting value of the percentage of that housholds?

- b. (6pts). Estimate the point t of diminishing return.

- c. (3pts). Estimate the year, approximately, in which the percentage of that houshold will reach the potential limit.

7 (13 pts.) The following table gives a function $f(x,y)$.

$y \setminus x$	5	10	15	25
1	90	81	75	72
3	94	86	81	77
5	97	90	86	82
7	105	99	93	89

a. (2pts). Find $f(10,5) =$

b. (6pts). Estimate $f_x(10,5)$ and $f_y(10,5)$.

c. (5pts). Estimate $f(12,6)$ using above results and the formula of linear approximation (use the *local linear approximation)* .

8. (12 pts).

- **a. (6pts).** Find f_x and f_y where $f(x,y) = x^2 + 2xy + y^3$.

- **b. (6pts).** Find f_r and f_{rt} where $f(r,t) = e^{rt}$.