Math 205 Exam III

7:15pm–8:15pm, Thursday, November 10, 2005

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 may use a calculator only for evaluations of values of algebraic formulae.** 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(13 total points). For the function $f(x) = x^3 - 15x^2$,

(a)(7 points) find the critical points of f,

(b)(6 points) use the first derivative test to determine if each critical point is a local maximum, a local minimum, or neither.

2(12 total points). Suppose that a function $f(x, y)$ satisfies $f(10, 20) = 12.8$, $f_x(10, 20) = -2$, and $f_y(10, 20) = 5$. Estimate $f(11, 18)$.

3(12 total points). For the function $f(x, y) = \frac{x}{2y^2}$, find
(a)(6 points) $f_x(x, y)$;

(b)(6 points) $f_y(2, 1)$.

4(12 total points). For the function $f(x, y) = y \ln x$, find
(a)(4 points) $f_{xx}(x, y)$;

(b)(4 points) $f_{xy}(x, y)$;

(b)(4 points) $f_{yy}(x, y)$.

5(12 total points). The following table give the number of Calories burned per minute, $B = f(w, s)$, for someone roller-blading, as a function of the person's weight, w, and speed, s.

(a)(6 points) Estimate $f_w(160, 10)$, and interpret your answer.

(b)(6 points) Estimate $f_s(160, 10)$, and interpret your answer.

6(13 total points). An ice cream company finds that at price of \$4.00, demand is 4000 units. For every \$0.25 decrease in price, demand increases by 200 units.

(a)(5 points) Find the demand q as a linear function of p, the price.

(b)(8 points) Find the elasticity of demand E when the price is \$4.00. Should the company increase or decrease the price in order to increase the revenue?

7(13 total points). A total cost function of a company for producing q units of some product is given by $C(q) = 0.000001q^3 - 0.006q^2 + 15q + 10000$, in dollars, where $0 \leq q \leq 5$.

(a)(4 points) If the conmpany can sell the product at the price of 15 dollars per unit, find a formula for the profit function.

(b)(6 points) Find the production level that maximizes the profit.

(c)(3 points) Find value of the maximum profit.

8(13 total points). A publisher printed $100,000$ copies of a new book. Suppose that t days since the release of the book,

$$Q(t) = \frac{80000}{1 + 399e^{-0.1t}}$$

copies were bought. That is, $Q(t)$ is a logistic function.

(a)(4 points) How many copies were bought immediately after its release?

(b)(5 points) When was the book sold at the peak speed?

(c)(4 points) How many copies, if any, of the book will never be bought?