MATH 205 EXAM 3

7:30—8:30 pm, Thursday April 19, 2007

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 (13pts), The function $f(x, y)$ is given by following table.

$y \setminus x$	8	9	10	11
120	4.2	5.8	7.4	8.9
140	5.1	6.7	8.3	9.9
160	6.1	7.7	9.2	10.8
180	7.0	8.6	10.2	11.7
200	7.9	9.5	11.1	12.6

a.(2pts). Find $f(10, 160) =$

b. (6pts). Estimate $f_x(10, 160)$ and $f_y(10, 160)$.

c.(5pts). Estimate $f(15, 170)$ by using above results and the local linear approximation: $\Delta f \approx f_x \Delta x + f_y \Delta y$.

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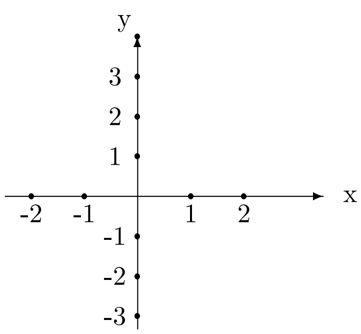
2 (12pts). Sketch a contour diagram for the function $f(x, y) = 2x - y$.



3 (10pts). The contour diagram of a function is given below. Estimate the partial derivatives of $f_x(3,3)$ and $f_y(3,3)$.

4. (15pts). Find the partial derivatives f_x, f_y of following functions.

- **1. (8pts).** $f(x,y) = 5x^2y - 3xy^3$.

- **2. (7pts).** $f(x,y) = 10x^2e^{3y}$.

5 (13pts). Find the partial derivatives f_x, f_y, f_{xx}, f_{xy} of follwoing functions.

- **1.(7pts).** $f(x, y) = x^2 - 2xy + y^2$.

- **2.(6pts).** $f(x, y) = \frac{2x}{y}$.

6. (12 pts). 6 each. Find all criutical points of the following functions.

- **1.** $f(x, y) = x^2 + y^2 + 6x - 10y + 8$.

- **2.** $f(x, y) = y^3 - 3xy + 6x$.

7 (13 pts.) Find the values x and y which maximize the function $f(x, y) = 2x^2 - xy + y^2 - 14x + 30$.
(Hint: Apply the test function $D = f_{xx} \cdot f_{yy} - f_{xy}^2$, and use the sign of f_{xx}.)

8. (12 pts). Apply Lagrange multiplier to find the extreme value of the function
$f(x, y) = x^2 + 3y^2 + 100$ subject to $8x + 6y = 76$.