

Math 213 (Fall 2004)

Name: _____

John Bowman

Mon 8:50

Mon 12:05

Wed 8:50

Wed 12:05

Yeon Hyang Kim

Mon 9:55

Mon 2:25

Wed 9:55

Wed 2:25

Exam 2

Thursday, November 11, 11:00

7 problems — 100 points — 70 minutes

Please write your NAME and circle your SECTION on top of this sheet.

Do not detach these sheets.

If you run out of space, use the back of the sheets.

Show ALL Work for Full Credit

NO GRAPHING CALCULATORS may be used on this exam

Problem 1 (15 points):

Problem 2 (15 points):

Problem 3 (10 points):

Problem 4 (15 points):

Problem 5 (15 points):

Problem 6 (15 points):

Problem 7 (15 points):

Total:

1. (15 points) Find all points where the function

$$f(x, y) = x^3 + y^2 + 4xy - 7x - 2y - 5$$

has relative minima, relative maxima, and saddle points (you do not need to compute the value of f at these points). Determine which is which.

2. (15 points) (a) Find the minimum of $f(x, y) = 2x^2 + y^2$ subject to the constraint $y = x - 6$.

(b) Check it is a minimum by comparing the values of f at the point you found and at least at one nearby point (x, y) which also satisfies the above constraint. (Consider two points in the xy -plane “nearby” if their x coordinates differ by at most 0.1, and their y coordinates also differ by at most 0.1).

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3. (10 points) Use the total differential to approximate $\sqrt{13.1^2 + 2.95^3}$.

4. (15 points) Find the double integral

$$\iint_R \sqrt{x+3y} \, dx \, dy$$

where R is the rectangle given by $1 \leq x \leq 5$ and $1 \leq y \leq 3$.

5. (15 points) Find the volume of the solid over the region R , bounded by the lines $y = x$, $y = 0$, $x = 2$, and under $f(x, y) = 2x + 3y$.

6. (15 points) Find the solution to the initial value problem (IVP)

$$\frac{dy}{dx} = y^2(e^x - x^2), \quad y(0) = 1.$$

7. (15 points) Find the solution to the initial value problem (IVP)

$$x \frac{dy}{dx} + 2y - \frac{e^x}{x} + 1 = 0, \quad y(1) = e.$$