

Math 211

Exam II

Lecture 2

Fall 2005

R. Shterenberg

Your Name: \_\_\_\_\_

Your TA: \_\_\_\_\_

Your Section Meeting time: \_\_\_\_\_

PART	POINTS	SCORE
I	20	
II	20	
III	20	
IV	20	
V	20	
TOTAL	100	

Show all your work: no work - no credit. Leave your answers in exact forms (using  $e$ ,  $\ln 2$ ,  $\sqrt{2}$  and similar numbers). Circle your answer. You may use the last page as scratch paper, but it will not be checked. Hand in your exam to your TA.

I. (20 points; 5 points per problem) In each problem find the derivative of  $f(x)$ .

(a)  $f(x) = e^{(x^3 - 3x^2)}$

(b)  $f(x) = x^2 \ln(x + x^{-2})$

(c)  $f(x) = \frac{\sqrt{x^2 + 1}}{x^4 - 1}$

(d)  $f(x) = 3^{(\sqrt{x}+1)}$

II. (20 points) The equation  $\sqrt{x^3 + y^4} + 2e^{2y-2} = 5$  defines  $y$  as a function of  $x$ .

Find the slope of the curve  $y = y(x)$  at the point  $x = 2, y = 1$ .

III. (20 points; 4 points per problem) Suppose  $f(x) = x^3 + 2x^2 + x$ .

(a) Find the critical points of  $f(x)$ .

(b) What are the intervals on which  $f(x)$  is increasing? Decreasing?

(c) What are the intervals on which  $f(x)$  is concave up? Concave down?

(d) Find where  $f(x)$  has a local minimum or maximum.

(e) Sketch the graph  $y = f(x)$ .

IV. (20 points; 7 points for problem a) or b); 6 points for problem c))

Suppose  $f(x) = x^{-1} - \frac{4x}{2x - 1}$ .

(a) Find the vertical and horizontal asymptotes.

(b) Find the intervals on which  $f(x)$  is increasing (decreasing).

(c) Sketch the graph  $y = f(x)$ . You don't need to determine concavity.

V. (20 points) A company wishes to design a box

whose volume is exactly 8 cubic feet. Let  $x$  be the length of a side of the base, and let  $y$  be the height. Find the dimensions  $x, y$  of the box requiring the least amount of materials.

Scratch paper

