

MATH 161

MIDTERM EXAM II

November 7, 2000

8:00-9:15 am (75 minutes)

NAME (please print legibly): _____

Your Soc. Sec. Number _____

Circle your Professor's name: Knapp Lubkin Matei Pizer

- No calculators are allowed on this exam.
- Please show all your work. You may not receive full credit for a correct answer if there is no work shown.
- Please indicate your final answer CLEARLY!

QUESTION	VALUE	SCORE
1.	25	
2.	25	
3.	10	
4.	10	
5.	10	
6.	10	
7.	10	
TOTAL	100	

1. (25 pts) Circle the correct answer.

(a) Let $f(x) = (2x^2 + x + 1)(3x - 1)$. Find $f'(0)$.

ANSWER: $-4, -3, -2, -1, 0, 1, 2, 3, 4$

(b) Let $f(x) = \frac{e^x}{3x + 3}$. Find $f'(1)$.

ANSWER: $\frac{-e^2}{2}, \frac{-e}{36}, \frac{-e}{6}, \frac{e}{12}, \frac{e}{6}, \frac{e}{36}, \frac{e^2}{12}$

(c) Find the slope of the tangent line to the curve

$$y^4 + x^2y^2 + yx^4 = y + 2 \quad \text{at } (1, 1).$$

ANSWER: $\frac{-5}{3}, \frac{-3}{2}, -1, 0, \frac{3}{2}, 2, 3, 4, \frac{5}{2}$

(d) Find $\left. \frac{d}{dx} \arcsin(x) \right|_{x=0}$.

ANSWER: $-1, \frac{-\pi}{2}, \frac{-\pi}{3}, \frac{-\pi}{6}, 0, \frac{\pi}{6}, \frac{\pi}{3}, \frac{\pi}{2}, 1$

(e) Let $f(x) = \sin(e^{2x})$. Find $f'(1)$.

ANSWER: $2e \cos(e^2), e \cos(e^2), 2e^2 \cos(e^2), 2e \sin(e^2), e \sin(e^2), 2e^2 \sin(e^2)$

2. (25 pts)

(a) Let $y = \tan(\sqrt{1-x})$. Find $\frac{dy}{dx}$.

ANSWER: _____

(b) Let $y = \ln(x) \sin(x^2)$. Find $\frac{dy}{dx}$.

ANSWER: _____

(c) Let $y = x^{2x}$. Find $\frac{dy}{dx}$.

ANSWER: _____

(d) Let $y = \arctan(2x)$. Find $\frac{dy}{dx}$.

ANSWER: _____

(e) Let $f(x) = (x^{11} + 6x^5 + 2x + 1)^4(3x + 1)^3(5x + 1)^2$. Find $f'(0)$.

Hint: $f'(0)$ is an integer between 20 and 40.

ANSWER: _____

3. (10 pts) Find the equation of the tangent line to the curve $\sqrt{x} + \sqrt{y} = 3$ at the point $(4, 1)$.

4. (10 pts) A particle moves on the x axis and its position at time t is given by $x(t) = t^3 - 12t + 3$.

(a) Find the velocity of the particle at time t .

ANSWER: _____

(b) Find the acceleration of the particle at time t .

ANSWER: _____

(c) Find the distance the particle travels from time $t = 0$ to $t = 3$.

ANSWER: _____

5. (10 pts) Two cars start moving from the same point. One travels south at 30 mi/h and the other travels west at 40 mi/h. At what rate is the distance between the cars increasing two hours later?

ANSWER: _____

6. (10 pts) Let $f(x) = \sqrt[3]{1 + 3x}$.

(a) Find the linearization (i.e. the tangent line approximation) of $f(x)$ at $x = 0$.

ANSWER: _____

(b) Use this linearization to approximate $\sqrt[3]{1.03}$.

ANSWER: _____

7. (10 pts)

(a) Let $f(x)$ be any function. Define what is meant by the “derivative of $f(x)$ ”. We want the “limit definition” of the derivative.

(b) Use the definition you have given in part (a) to find the derivative of $\sqrt{1+x}$.
(Note: do not just write down the derivative, you must derive it from your definition.)