

MATH 2200

Midterm Exam I

September 22, 2009

NAME (please print legibly): _____

Your University ID Number: _____

Please complete all questions in the space provided. You may use the backs of the pages for extra space, or ask me for more paper if needed. Work carefully, and try to complete the problems you find easier before going back to the harder ones. Good luck!

QUESTION	VALUE	SCORE
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	15	
10	10	
TOTAL	105	

1. (10 points) Three-way matching. Match the names of the derivative rules in the left column with the functions in the middle column and the derivatives in the right-hand column so that each rule is matched with its definition. **Draw lines from one column to the next to indicate your choices.**

a. Chain Rule	$\frac{d}{dx} \frac{f(x)}{g(x)}$	$= f'(x)g(x) + g'(x)f(x).$
b. Product Rule	$\frac{d}{dx} f(g(x))$	$= \frac{f'(x)g(x) - g'(x)f(x)}{(g(x))^2}$
c. Quotient Rule	$\frac{d}{dx} f(x)g(x)$	$= f'(g(x))g'(x).$

2. (10 points) Use the **definition of the derivative as a limit** to find the derivative of

$$f(x) = (x + 2)^2.$$

You will receive **no credit on this problem** for doing the derivative using the ordinary differentiation laws.

3. (10 points) Use the **product** rule to find the derivative of

$$h(x) = (3x + 2)(x^2 + 5x + 3).$$

Please do **not** simplify your answer.

ANSWER: _____

4. (10 points) Find the derivative of

$$h(x) = \frac{x^3 - 5x + 1}{x + 2}.$$

using the **quotient** rule. Please do **not** simplify your answer.

ANSWER: _____

5. (10 points) Find the equation of the tangent line to the curve $y = x^3 + 2x + 1$ at the point $(1, 4)$. Express your answer in **point-slope** form.

ANSWER: _____

6. (10 points) The number of mosquitos on Herty Field is approximated by the function

$$m(t) = t^2 - 11t + 48,$$

where t is the number of hours after 12pm. Please find the **rate of change** of the number of mosquitos at 7pm. Express your answer using the units mosquitos/hour.

ANSWER: _____

7. (10 points) Find the derivative of

$$f(x) = (5x + 2)^{17}$$

using the **chain rule**. Please do **not** simplify your answer. Do not be tempted to multiply out $(5x + 2)$ to the 17th power in order to write this as a polynomial– that answer is worth 0 points for this question. If you don't remember how to do this problem using the chain rule, move on to the next question.

ANSWER: _____

8. (10 points) Find the limit

$$\lim_{\theta \rightarrow 0} \frac{\tan \theta}{\theta}.$$

ANSWER: _____

9. (15 points) Find each of the limits

$$\lim_{x \rightarrow 3^+} \frac{x^2 + 2x + 1}{x - 3}, \quad \lim_{x \rightarrow 3^-} \frac{x^2 + 2x + 1}{x - 3}, \quad \text{and} \quad \lim_{x \rightarrow 3} \frac{x^2 + 2x + 1}{x - 3}$$

If the limit does not exist, please write $+\infty$, $-\infty$ or DNE for the value of the limit.

ANSWER: _____

10. (10 points) Use interval notation to indicate where the function

$$f(x) = \begin{cases} \frac{x-3}{x^2-5x+6}, & x \neq 3, \\ 1, & x = 3. \end{cases}$$

is continuous. Be very careful, and use the definition of continuity, at the points where the quotient above has a zero in the denominator.

ANSWER: _____