

MATH 2200/2300H

Midterm Exam I

September 22, 2004

NAME (please print legibly): _____

Your University ID Number: _____

Please complete all 10 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	10	
10	10	
TOTAL	100	

1. (10 points) Use the limit laws to find

$$\lim_{x \rightarrow 3} x^2 + 2x + 4.$$

if it exists. If it does not exist, answer $+\infty$ or $-\infty$ if the limit does not exist because the function approaches $+\infty$ or $-\infty$ and “does not exist” if the limit does not exist for some other reason. *You must cite a limit law for each step of your derivation for full credit.*

ANSWER: _____

2. (10 points) Use the limit laws to find

$$\lim_{x \rightarrow -4} \frac{x^2 + 6x + 8}{x + 4}.$$

if it exists. If it does not exist, answer $+\infty$ or $-\infty$ if the limit does not exist because the function approaches $+\infty$ or $-\infty$ and “does not exist” if the limit does not exist for some other reason. *You must cite a limit law for each step of your derivation for full credit.*

ANSWER: _____

3. (10 points) Let

$$f(x) = \begin{cases} x^3 + 9 & : x > 2 \\ x - 2 & : x \leq 2 \end{cases}$$

Use the limit laws to find

$$\lim_{x \rightarrow 2^+} f(x).$$

if it exists. If it does not exist, answer $+\infty$ or $-\infty$ if the limit does not exist because the function approaches $+\infty$ or $-\infty$ and “does not exist” if the limit does not exist for some other reason. *You must cite a limit law for each step of your derivation for full credit.*

ANSWER: _____

4. (10 points) Find the limit

$$\lim_{x \rightarrow 5} \frac{5x + 3}{(x - 5)^2}$$

if it exists. If it does not exist, answer $+\infty$ or $-\infty$ if the limit does not exist because the function approaches $+\infty$ or $-\infty$ and “does not exist” if the limit does not exist for some other reason. *You must cite a limit law for each step of your derivation for full credit.*

ANSWER: _____

5. (10 points) Let

$$f(x) = 5x^5 + 24x^2 + 16x + 3. \quad (1)$$

Find $f'(x)$ using the derivative laws. Do not use the definition of the derivative as a limit. Cite the derivative laws as you use them.

ANSWER: _____

6. (10 points) Let

$$f(x) = (x^2 + 5)(x - 3). \quad (2)$$

Find $f'(x)$ using the product rule for derivatives. Do not multiply out the product before differentiating (though you may do so to check your work). You should not simplify your answer by multiplying out all the terms.

ANSWER: _____

7. (10 points) Let

$$f(x) = \frac{x^3 + 2x}{x - 4}.$$

Find $f'(x)$ using the quotient rule for derivatives. You don't need to simplify your answer.

ANSWER: _____

8. (10 points) Find the equation of the tangent line to the curve $y = x^3 + 3$ at the point $(2, 11)$. Please express your answer in point-slope form.

ANSWER: _____

9. (10 points) Let

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

Use the *definition of the derivative as a limit* to find $f'(x)$. As before, you must cite limit laws when you use them for full credit.

ANSWER: _____

10. (10 points) Is the function

$$f(x) = \begin{cases} 0 & : x = -2. \\ \frac{x^2+4x+4}{x+2} & : x \neq -2 \end{cases}$$

continuous at $x = -2$? State your reasons for your answer. You must write down the definition of continuity for functions (including a limit) and compute the limit in that definition to get full credit for this problem.