

By signing below, you attest that you have neither given nor received help of any kind on this exam.

Signature: _____ Printed Name: _____

Instructions: Show work to get full credit (the correct answer may NOT be enough). Do all your work on the paper provided. Write clearly! Double check your answers!

You will **not** receive full credit for using methods other than those discussed in class.

Calculators are not permitted.

EXAM II

MAT 181 – CALCULUS I

Problem Number	Available Points	Your Points
1	4	
2	6	
3	5	
4	7	
5	14	
Total	36	

1. Determine if the following function is differentiable at $x = 1$:

[(4)]

$$f(x) = \begin{cases} 2x^3 + 2 & \text{for } x \leq 1 \\ 6x - 1 & \text{for } x > 1 \end{cases}$$

You must justify your answer using appropriate limits or appropriate theorems.

2.

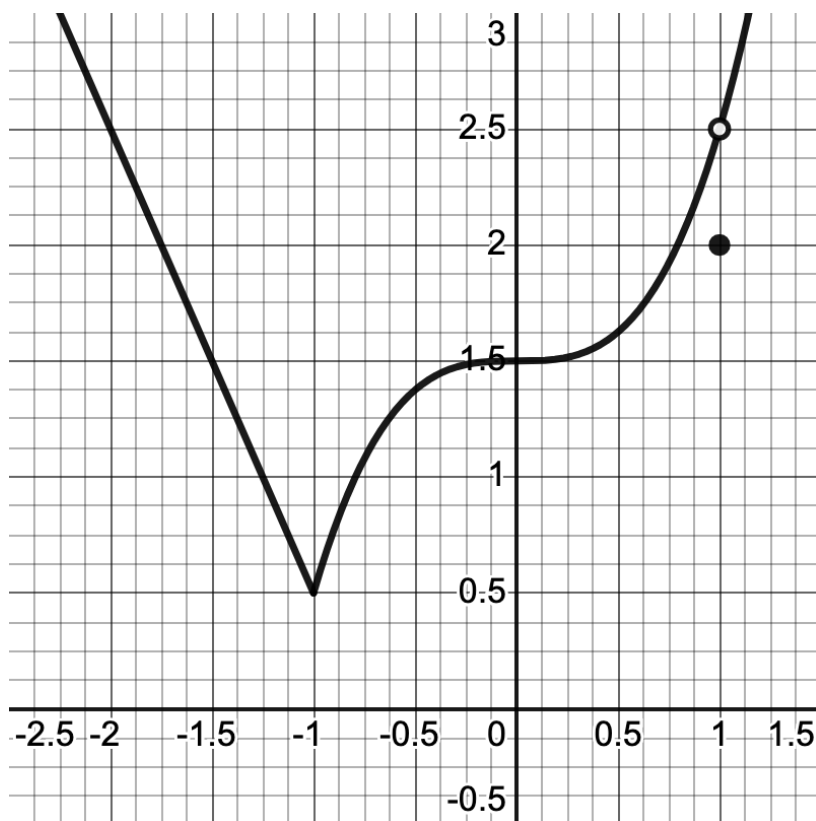
[(6)]

- (a) Let $y = f(x)$ be a function and let c be a value in the domain of f . Without using the word “prime,” “derivative,” or “differentiate,” write a single English sentence with appropriate punctuation that interprets what is meant by the symbol $f'(c)$. [1]

- (b) Use the **limit definition** to compute the derivative function $f'(x)$ for $f(x) = x^3 - 2x + \pi$. Show all work. [5]

3. Let the graph of $y = f(x)$ be given below.

[(5)]



(a) Evaluate the following derivatives. If it doesn't exist, write DNE.

i. $f'(-1.5) =$ _____

[1]

ii. $f'(-1) =$ _____

[1]

iii. $f'(0) =$ _____

[1]

iv. $f'(1) =$ _____

[1]

(b) Use the graph of f above to evaluate the following limit:

[1]

$$\lim_{x \rightarrow -1^-} \frac{f(x) - f(-1)}{x + 1}$$

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4. Consider the function $f(x) = 12\sqrt{x} - \frac{3}{2}x^2 - x - 2$. [(7)]
- (a) On what interval(s) is this function continuous? [1]
- (b) On what interval(s) is this function differentiable? [1]
- (c) Find the average rate of change of this function over the interval $[0, 4]$. [2]
- (d) Find the equation of the tangent line to $f(x)$ at the point $(4, f(4))$. Your final answer should be in slope-intercept form. [3]

5. Find the derivative of the functions below using methods discussed in class. You do not have to simplify. [(14)]

(a) $f(x) = 3^x + 3^3 + x^3$ [2]

(b) $f(x) = e^{4x} + e^4$ [2]

(c) $f(x) = x^{1/4} \cot(x)$ [2]

(d) $f(x) = \frac{5x}{3} + \sqrt{1-x^2}$ [2]

(e) $f(x) = \frac{x^4 \sec(x)}{x^2 + 1}$ [3]

(f) $f(x) = \cos^3(9x + \sqrt{3x^2 - 6}) + 21$ [3]