

MATH-140
Spring 2026
Exam 2 Review
February 18, 2026

Name: _____

Pledge: _____

Each question topic and point value is recorded in the tables below. Note that this exam must be completed within the 50 minutes allotted during class. Also, you must work without any external resources, which includes no notes, calculator, nor any equivalent software. You must show an appropriate amount of work to justify your answer for each problem. If you run out of room for a given problem, you may continue your work on the back of the page. By writing your name and signing the pledge you are stating that you understand the rules outlining this exam.

Scoring Table

| Question | Points | Score |
|----------|--------|-------|
| 1 | 8 | |
| 2 | 8 | |
| 3 | 8 | |
| 4 | 10 | |
| 5 | 8 | |
| 6 | 8 | |
| Total: | 50 | |

Topics Table

| Question | Topic |
|----------|------------------------------------|
| 1 | Limit Definition of the Derivative |
| 2 | Basic Derivative Rules |
| 3 | Product, Quotient, and Chain Rules |
| 4 | Implicit Differentiation |
| 5 | Derivatives of Inverse Functions |
| 6 | Tangent Lines |
| | |

1. (a) (3 points) State the limit definition of the derivative.

(b) (5 points) Use the limit definition to find the derivative of

$$f(x) = \sqrt{x + 4}.$$

2. (a) (3 points) State the constant, constant multiple, sum/difference, and power rule.

(b) (5 points) Find the derivative of the following function. Clearly break the problem into smaller problems and state which rules you are using along the way.

$$f(x) = 3x^4 - 2x^2 + 5 \sin(x) - 4e^x + \ln(x).$$

3. (a) (3 points) State the product, quotient, and chain rules for the derivative.

(b) (5 points) Find the derivative of the following function. Clearly break the problem into smaller problems and state which rules you are using along the way.

$$f(x) = \frac{x^2 \sin(3x)}{\sqrt{x^2 + 1}}.$$

4. (10 points) Use implicit differentiation to find dy/dx for

$$x^2 + \cos(xy) + y^2 = 10.$$

5. (a) (4 points) Use implicit differentiation to find the derivative of $\ln(x)$. Your final answer should be in terms of x .

(b) (4 points) Use implicit differentiation to find the derivative of $\arctan(x)$. Your final answer should be in terms of x .

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6. (a) (4 points) Find the equation of the line tangent to the graph of

$$x^2 + \cos(xy) + y^2 = 10$$

at the point $(0, 3)$.

- (b) (4 points) Find where the line tangent to the graph of

$$y = \arctan(x)$$

has a slope of 1.