

MATH 111I: Final Exam
Spring — 2025
05/01/2025
150 Minutes

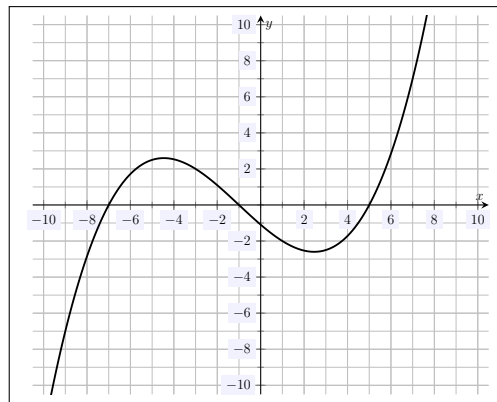
Name: _____

Write your name on the appropriate line on the exam cover sheet. This exam contains 15 pages (including this cover page) and 15 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work. If you run out of room for an answer, continue on the back of the page — being sure to indicate the problem number.

Question	Points	Score
1	6	
2	6	
3	6	
4	6	
5	6	
6	6	
7	6	
8	6	
9	6	
10	6	
11	6	
12	6	
13	6	
14	6	
15	6	
Total:	90	

1. (6 points) Find the average rate of change of $f(x) = 2x^2 - 4x + 5$ on the interval $[-1, 2]$.

2. (6 points) Consider the graph of the relation $f(x)$ below.



- (a) Is $f(x)$ a function? Explain why or why not.
- (b) Does $f(x)$ have an inverse? Explain why or why not.
- (c) Find the root(s) for $f(x)$.
- (d) Find the y -intercept for $f(x)$.
- (e) Find $f(-9)$.
- (f) Solve the equation $f(x) = 3$.

3. (6 points) Find the equation of the line through the y -intercept of $y = 3x - 5$ that is parallel to the line $y = 9 - 6x$.

4. (6 points) A band receives a flat performance payment of \$15,000. They also receive 15% of each of the \$60 tickets sold. Let $M(T)$ be the amount of money the band makes in total for their performance if T tickets are sold.

(a) Explain why $M(T)$ is linear.

(b) Find $M(T)$.

5. (6 points) The population of a town y years from now, $P(y)$, is a linear function of time. The Census Bureau determines that $P(y) = 35000 - 670y$.

(a) Find and interpret the y -intercept of $P(y)$.

(b) Find an interpret the slope of $P(y)$.

(c) When will the town have 25,000 people in it?

6. (6 points) Showing all your work, factor the following as completely as possible:

(a) $x^2 - 9$

(b) $x^2 - 2x - 24$

(c) $6x^2 + 19x + 10$

7. (6 points) Showing all your work, solve the following quadratic equation using the quadratic formula:

$$1 = x(4 - x)$$

8. (6 points) Find the domain of the following functions:

(a) $f(x) = x^3 - 4x + 9$

(b) $g(x) = \sqrt{x + 8}$

(c) $h(x) = \frac{x + 5}{x + 4}$

(d) $j(x) = \ln(x - 6)$

(e) $k(x) = 6e^{3x}$

9. (6 points) Find functions $f(x)$ and $g(x)$ so that the following functions can be written in the form $f(g(x))$:

(a) e^{x-x^2}

(b) $7(2x+3)^9$

(c) $\frac{1}{\ln(x)}$

10. (6 points) Showing all your work, find the vertex for $x^2 + 8x + 13$.

11. (6 points) Consider the exponential function $y = 6(3^{2x-1})$.

(a) Write this exponential function in the form $y = Ab^x$.

(b) Is y growing or shrinking exponentially? Explain.

(c) Determine the y -intercept for this function.

12. (6 points) Consider the exponential function $f(x) = 441.3(0.85)^x$.

(a) What is the 'initial value' for $f(x)$?

(b) Does $f(x)$ have growing exponentially or decaying exponentially? Explain.

(c) Find the growth or decay rate for $f(x)$.

13. (6 points) Showing all your work, complete the following:

(a) Rewrite $\log_6(x) = w$ as an exponential equation.

(b) Rewrite $e^{4x} = t$ as a logarithmic equation.

(c) Compute $\log_4(5)$.

14. (6 points) Rewrite each of the following in the form $x^{a/b}$ for some a, b .

(a) $\sqrt[3]{x^7}$

(b) $\frac{1}{\sqrt{x}}$

(c) $\sqrt{x^5}$

15. (6 points) You invest \$7,000 at 1.2% annual interest, compounded continuously.

(a) How long until the investment is worth \$9,000?

(b) How much money is the investment worth after 5 years?