

Math 13100 – Section 58 – Midterm 1

January 22, 2016

Information and Directions

- This exam will last 50 minutes.
- This is a closed-book exam.
- No electronic devices are allowed to be used during this exam.
- Partial credit is given for showing your calculations and explaining your thoughts.

Name: _____

Problem	Points	Score
1	25	
2	25	
3	15	
4	35	

Problem 1 (25 points)

Consider the real numbers x that are solutions to this inequality:

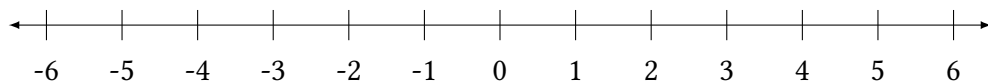
$$11 < 3x + 8 < 23$$

Part 1 (10 points)

Express the set of solutions as an interval. Is it an open, closed, or half-open interval?

Part 2 (5 points)

On this depiction of the real line, highlight / mark where the solutions of this inequality are.



Part 3 (10 points)

Find real numbers a and b such that this inequality has the same solutions as $|x - a| < b$.

Hint: Remember, $|x - a|$ is the distance of x away from a , so the solutions to the inequality $|x - a| < b$ are the real numbers that are at most b away from the “center” a .

Problem 2 (25 points)

Consider the functions

$$f(x) = 2 + \sqrt{x + 4} \qquad g(x) = \frac{1}{x - 2}$$

Part 1 (10 points)

What is the natural domain of f ? What is the natural domain of g ?

(That is, for what inputs x are they each defined?)

Part 2 (5 points)

Using your knowledge of what it means to add functions, calculate $(f + g)(12)$.

Part 3 (10 points)

Using your knowledge of what it means to compose functions, calculate $(g \circ f)(5)$.

(Be sure to notice what order g and f are in!)

Problem 3 (15 points)

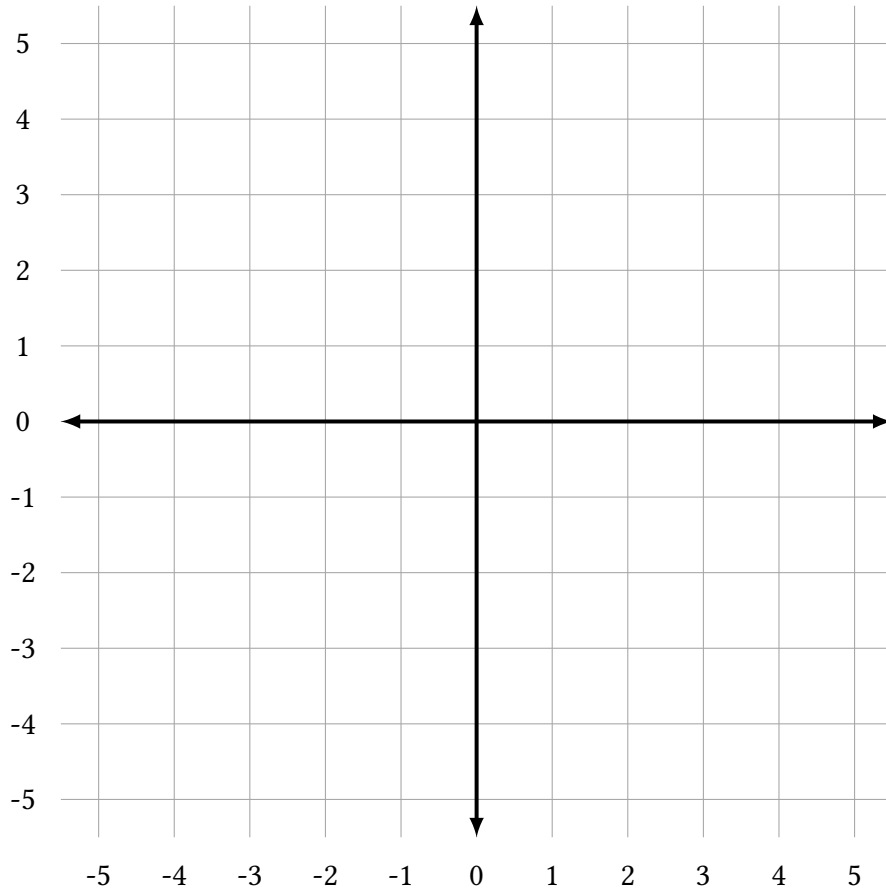
Consider the function

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

Part 1 (5 points)

On this depiction of the plane, draw the graph of the equation $y = f(x)$.

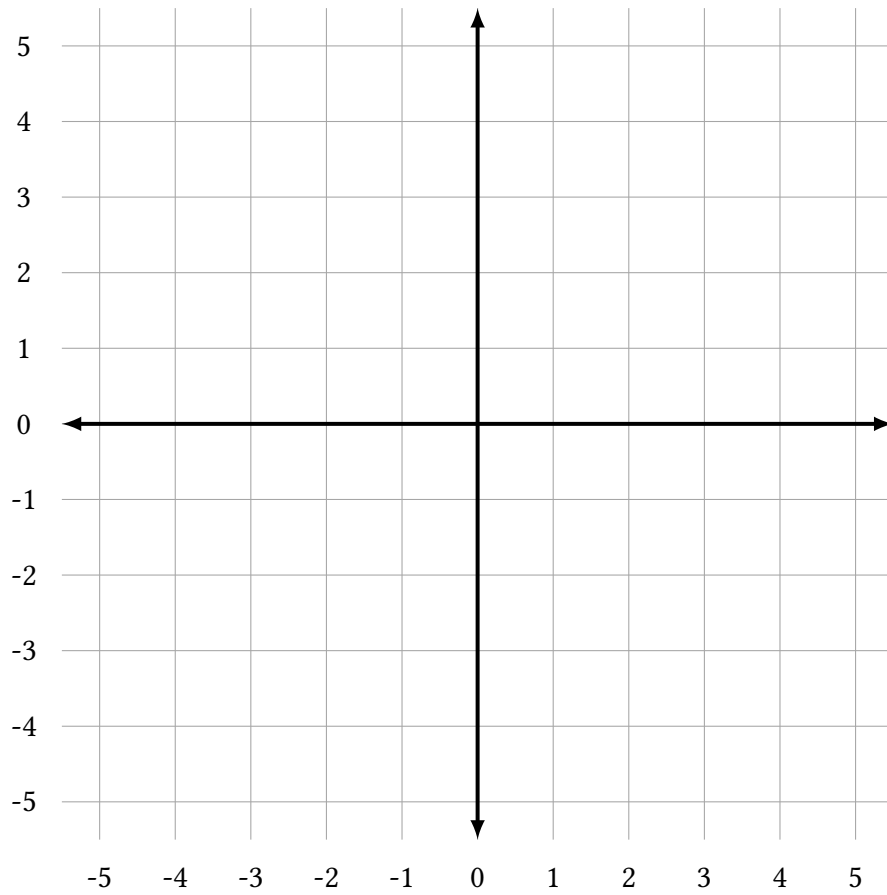
For at least three different points on your graph, label the point with its x - and y -coordinates.



Part 2 (10 points)

On this depiction of the plane, draw the graph of the equation $y = f(x - 1) - 3$.

For at least three different points on your graph, label the point with its x - and y -coordinates.



Problem 4 (35 points)

Part 1 (20 points)

Let c and L be real numbers, and let f be a function. Give the precise, mathematical meaning of the statement

$$\lim_{x \rightarrow c} f(x) = L$$

Part 2 (15 points)

Give a formal proof that $\lim_{x \rightarrow 1} f(x) = 3$, where $f(x) = x^2 - 3x + 5$.