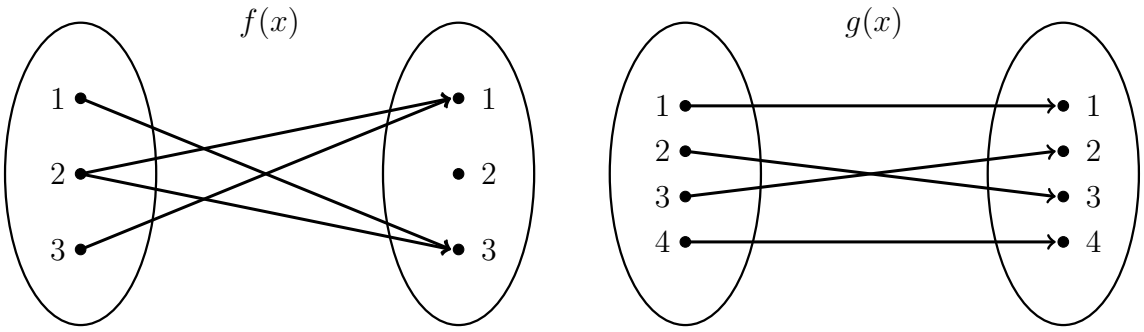
MAT 101: Exam 2 **Name:** _____
Summer – 2022
06/02/2022
85 Minutes

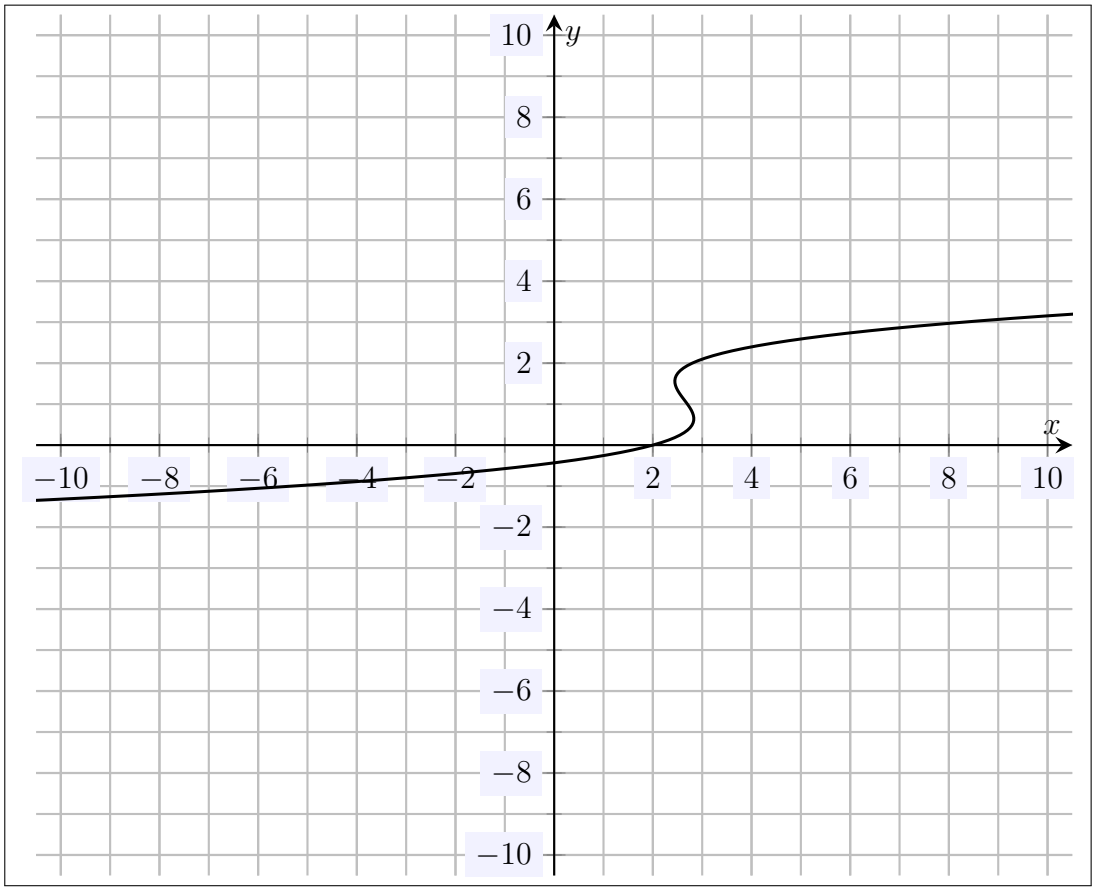
Write your name on the appropriate line on the exam cover sheet. This exam contains 21 pages (including this cover page) and 20 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work.

Question	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
11	10	
12	10	
13	10	
14	10	
15	10	
16	10	
17	10	
18	10	
19	10	
20	10	
Total:	200	

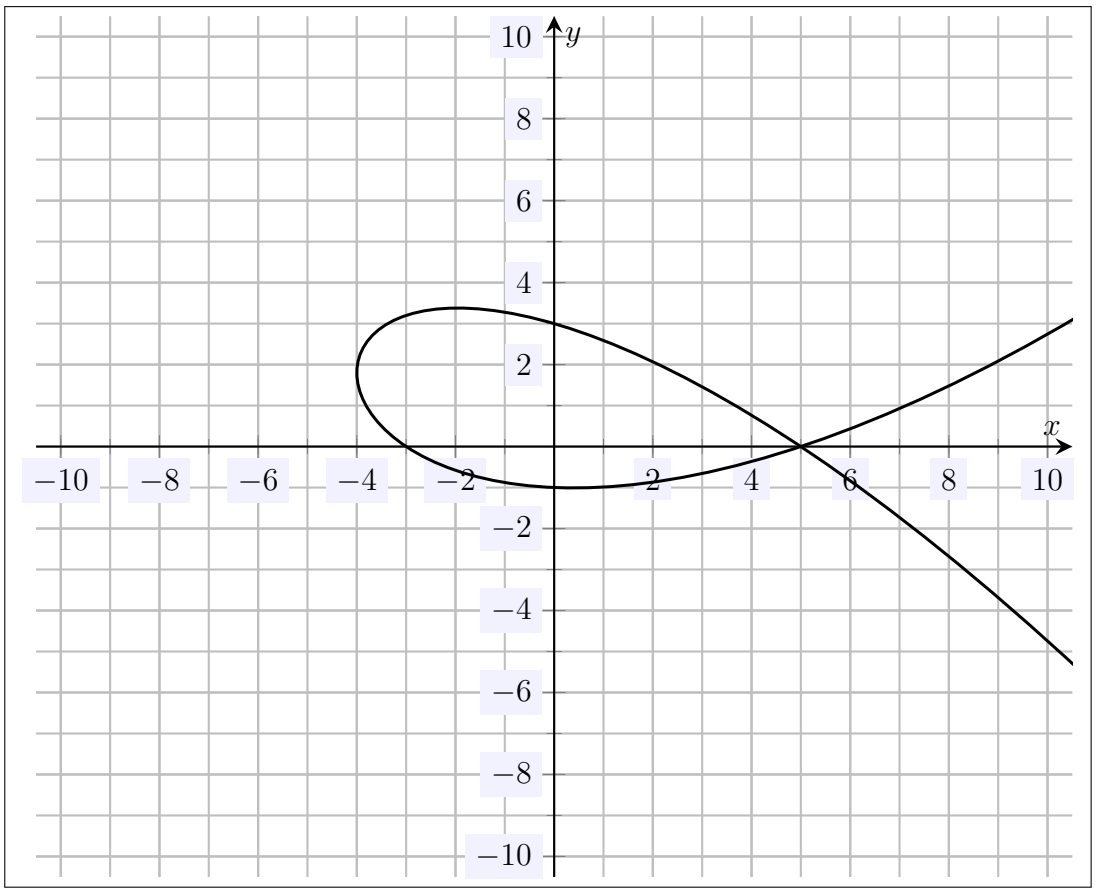
1. (10 points) Determine whether the relations $f(x)$ and $g(x)$ shown below are functions. If the relation is a function, explain why. If the relation is not a function, explain why not.



2. (10 points) Determine whether the relation shown below is a function. If the relation is a function, explain why. If the relation is not a function, explain why not.



3. (10 points) For the relation shown below, determine the x and y-intercepts.



4. (10 points) Suppose $f(x)$, $g(x)$, and $h(x)$ are functions whose values are given below.

x	-5	-3	-1	0	2	6	10
$f(x)$	7	10	0	$\frac{2}{3}$	-4	2	$\sqrt{2}$
$g(x)$	0	π	6	$\frac{4}{5}$	1	-3	4
$h(x)$	$\frac{9}{8}$	0	-3	-1	-1	8	-8

Compute the following, simplifying as much as possible:

(a) $(f+h)(-1) =$

(b) $(h-f)(10) =$

(c) $(-2g)(2) =$

(d) $\left(\frac{h}{f}\right)(0) =$

(e) $g(-3)\,h(6) =$

(f) $h(2-f(2)) =$

(g) $(g \circ h)(0) =$

(h) $(f \circ g)(-5) =$

(i) $(g \circ f)(6) =$

(j) $(g \circ f \circ h)(-1) =$

5. (10 points) Suppose $f(x)$ and $g(x)$ are the functions given below.

$$f(x) = 1 - x^2$$

$$g(x) = 2x + 1$$

Compute the following, simplifying as much as possible:

(a) $\left(\frac{f}{g}\right)(x) =$

(b) $g(x) - f(x) =$

(c) $f(x)\, g(x) =$

(d) $(f \circ g)(x) =$

(e) $(g \circ f)(x) =$

6. (10 points) Suppose that $f(x)$ is a function defined on all real numbers whose inverse exists. A few values of $f(x)$ are given below.

x	1	2	3	4
$f(x)$	3	4	1	2

Compute the following:

(a) $f(4) =$

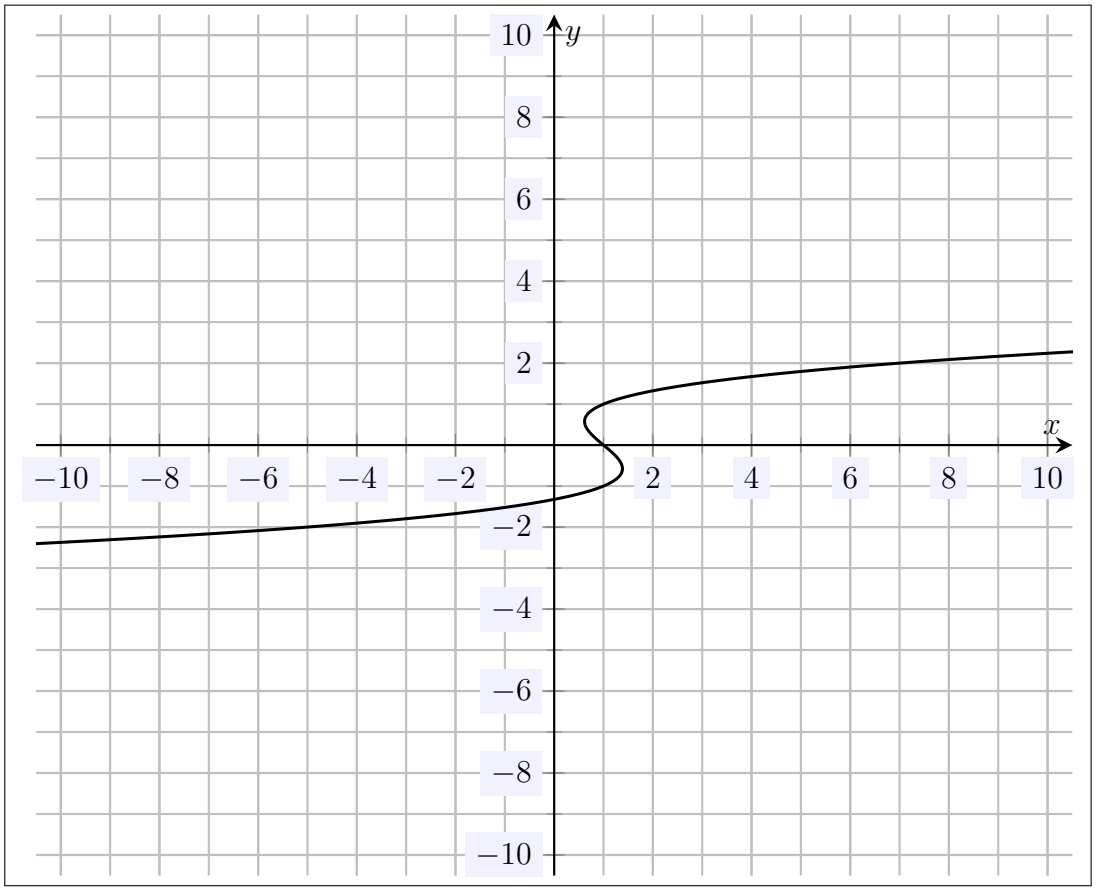
(b) $\big(f(1)\big)^2 =$

(c) $f^{-1}(3) =$

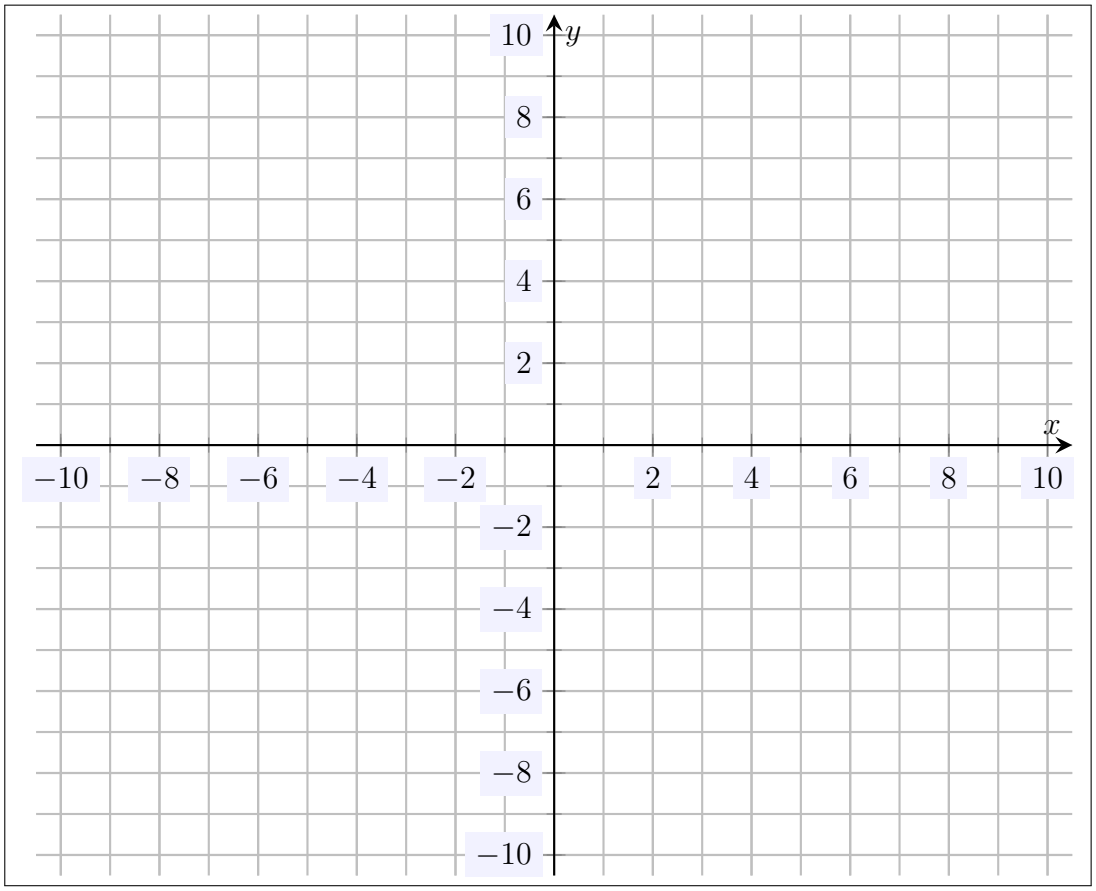
(d) $f^{-1}(f(20)) =$

(e) $(f \circ f^{-1})(5) =$

7. (10 points) Explain whether the relation shown below has an inverse. If it does, sketch the inverse. If it does not, explain why.



8. (10 points) As accurately as possible, sketch the line $2x - 3y = 6$ on the plot below. Your plot should include at least three points that are exactly on the line.



9. (10 points) Determine whether the table of values below could be given by a linear function. If not, explain why. If it can, find the linear function.

x	0.2	3.6	5.1
y	9.84	-1.38	-6.33

10. (10 points) Determine whether the following lines are the parallel, perpendicular, or neither. Be sure to justify your answer.

$$\ell_1: \quad 2x - y = 5$$

$$\ell_2: \quad -2x + 4y = 24$$

11. (10 points) Consider the line $4x - 6y = 12$.

    (a) Determine the slope of the given line.

    (b) Interpret the slope in at least two different ways.

    (c) Is the function whose graph is the given line an increasing or decreasing function? Explain.

    (d) Determine the y-intercept of the given line.

    (e) Determine the x-intercept of the given line.

12. (10 points) A caterer charges a flat fee for each person for whom a meal has to be prepared. The caterer charges \$270 for 15 people and \$360 for 20 people. Let $C(p)$ denote the cost of hiring the caterer to prepare food for p people.

    (a) Explain why $C(p)$ is linear.

    (b) Find $C(p)$.

    (c) Interpret the slope of $C(p)$ in the context of the problem.

    (d) Find and interpret $C(32)$.

13. (10 points) A certain species of fungus reproduces by releasing tiny spores. The larger the fungus, the more spores that are released. Scientist find that the number of spores (in thousands) a fungus with diameter d (in inches) can be modeled by $N(d) = -3.5 + 15.5d$.

    (a) Find and interpret the slope of $N(d)$ in the context of the problem.

    (b) Find and interpret in the context of the problem, if possible, the y-intercept of $N(d)$.

    (c) According to the model, how large would the fungus have to be in order for it to release 100,000 spores?

14. (10 points) Showing all your work, find the equation of the line whose x-intercept is $(-1, 0)$ that has slope $-\frac{6}{7}$.

15. (10 points) Showing all your work, find the equation of the line that is parallel to the line $x = 4$ that contains the y-intercept of the line $-6x + 5y = 11$.

16. (10 points) Showing all your work, find the equation of the line that is perpendicular to the line $y = 6 - 7x$ at its y-intercept.

17. (10 points) Showing all your work, solve the following equation and then verify your solution:

$$6\left(\frac{1}{2}x + 5\right) = 28$$

18. (10 points) Showing all your work, solve the following equation:

$$7x + 4 = 6 - 2(3 - x)$$

19. (10 points) Showing all your work, solve the following equation:

$$\sqrt{2}\left(x-\sqrt{2}\right)=\frac{x+5}{3}$$

20. (10 points) Showing all your work, solve the following equation:

$$\frac{x+6}{1-x} = 10$$