

**MAT 101: Exam 1**  
**Spring — 2024**  
**02/21/2024**  
**85 Minutes**

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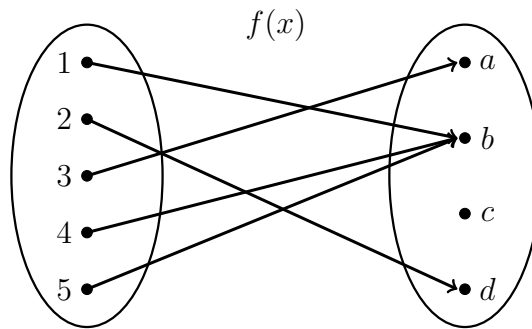
**Name:** \_\_\_\_\_

Write your name on the appropriate line on the exam cover sheet. This exam contains 11 pages (including this cover page) and 10 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	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
Total:	100	

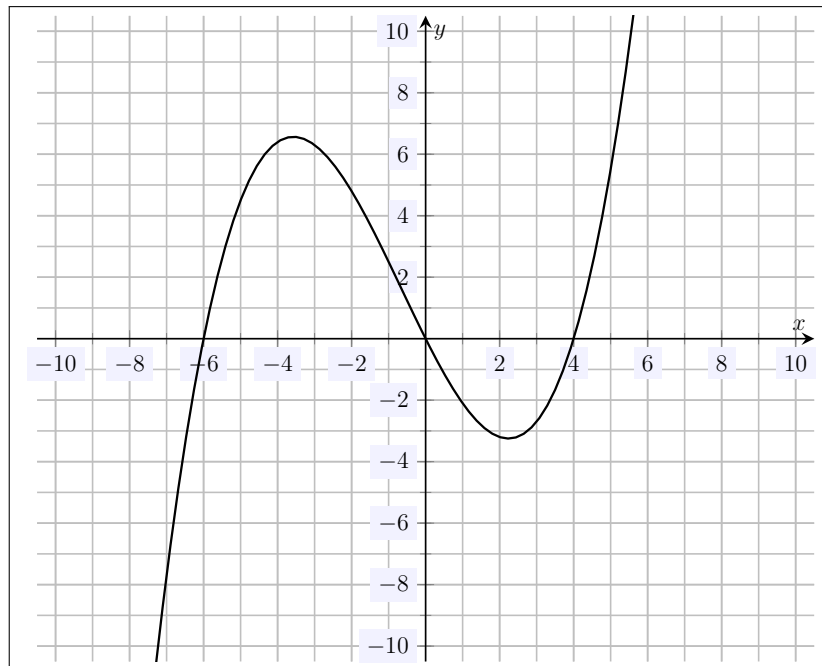
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1. (10 points) Consider the relation given by the diagram below.



- (a) Is the relation a function? Explain.
- (b) Find the domain of the relation.
- (c) Find the codomain of the relation.
- (d) Find the range of the relation.

2. (10 points) Consider the relation plotted below.



- (a) Is this relation a function of  $x$ ? Explain.
- (b) Is this relation a function of  $y$ ? Explain.
- (c) If one were to consider this relation as a function of  $x$ , would the relation have an inverse? Explain.

3. (10 points) Let  $f(x)$  be the relation given by  $f(x) = x(x - 1)(x + 3)$ .
- (a) Is  $f(x)$  a function? Explain.
  - (b) Find  $f(2)$ .
  - (c) Find the  $y$ -intercept(s) of  $f(x)$ .
  - (d) Find the  $x$ -intercept(s) of  $f(x)$ .

4. (10 points) Let  $f(x)$  and  $g(x)$  be functions for which a table of values is given below.

$x$	-5	-2	0	1	2	3
$f(x)$	6	-1	3	4	3	-1
$g(x)$	-5	7	-2	4	0	6

Based on the table above, compute the following:

- (a)  $f(-2) - g(3)$
- (b)  $(f + g)(2)$
- (c)  $(fg)(-5)$
- (d)  $(g \circ f)(0)$
- (e)  $(f \circ g)(0)$

5. (10 points) Let  $g(x) = x^2 + 2x - 3$ .

(a) Find  $g(2)$  and  $g(-4)$ .

(b) Based on your answer to (a), can  $g^{-1}(x)$  exist? Explain.

6. (10 points) Consider the function  $\ell(x) = \frac{4 - 3x}{5}$ .

- (a) Explain why  $\ell(x)$  is linear.
- (b) Find the slope of this function.
- (c) Find the  $y$ -intercept of this function.
- (d) Find the  $x$ -intercept of this function.
- (e) Does the graph of this function contain the point  $(3, -1)$ ? Explain.

7. (10 points) Explain why the function  $f(x) = 3(5 - 2x)$  has an inverse. Furthermore, find the inverse. Be sure to show all your work. [You do not need to verify that your inverse is indeed the inverse.]



8. (10 points) Find the exact equation of the line with  $x$ -intercept  $-6$  and  $y$ -intercept  $4$ . Show all your work.

9. (10 points) Find the exact equation of the line parallel to the line  $4x - 3y = 6$  whose graph contains the point  $(-9, -8)$ . Show all your work.

10. (10 points) Find the equation of the line perpendicular to  $y = \frac{5-3x}{6}$  whose graph passes through the  $x$ -intercept of the line  $-3x + 9y = 15$ . Show all your work.