Assignment

Name _____ Date _____

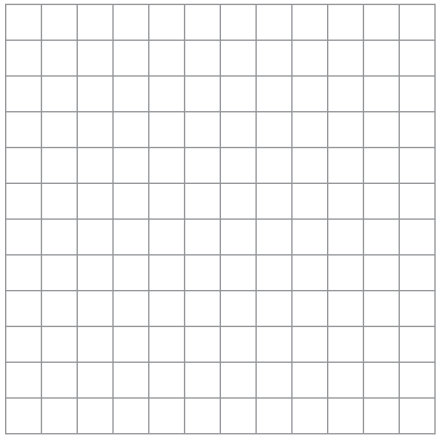
Shifting Away
Vertical and Horizontal Translations

1. Graph each cubic function on the grid.

a. $y = x^3$

b. $y = x^3 + 3$

c. $y = x^3 - 3$

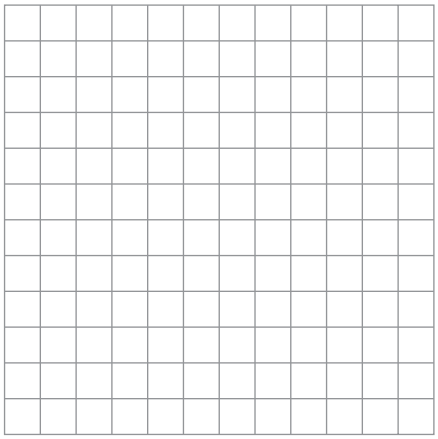


2. Graph each square root function on the grid.

a. $y = \sqrt{x}$

b. $y = \sqrt{x} + 3$

c. $y = \sqrt{x} - 3$

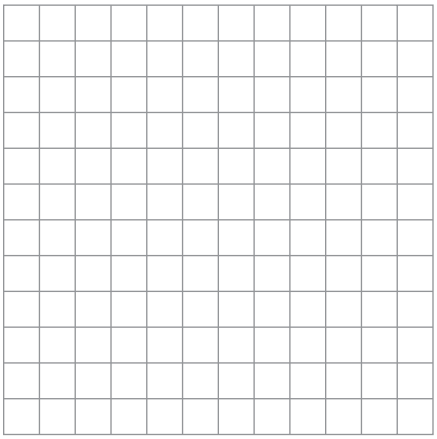


3. Graph each linear function on the grid.

a. $y = x$

b. $y = -x + 3$

c. $y = -x - 3$



4. In Questions 1 through 3, part (a) is a basic function.

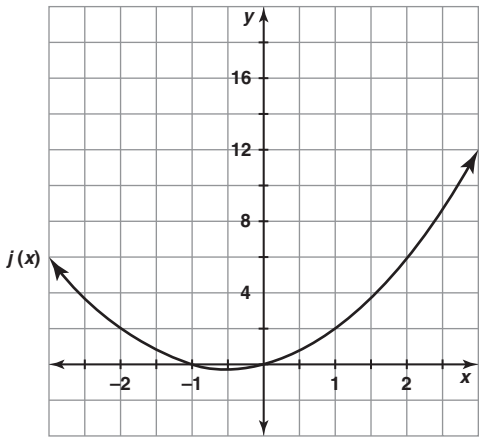
a. Describe how adding 3 changed each graph in part (b).

b. Describe how subtracting 3 changed each graph in part (c).

5. The graph of a function $j(x)$ is shown. Sketch the graph of

a. $j(x) + 4$

b. $j(x) - 2$



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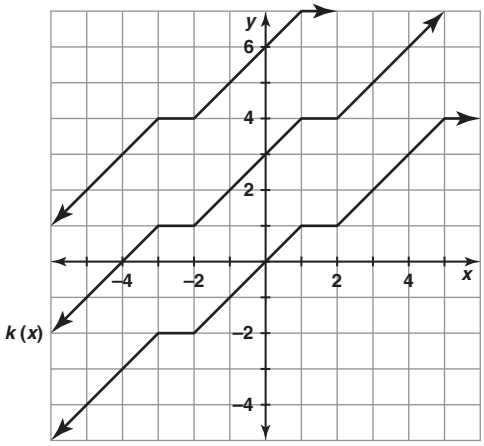
6. The graph of the function $k(x)$ is shown. Write a function in terms of $k(x)$ for each vertical translation shown.

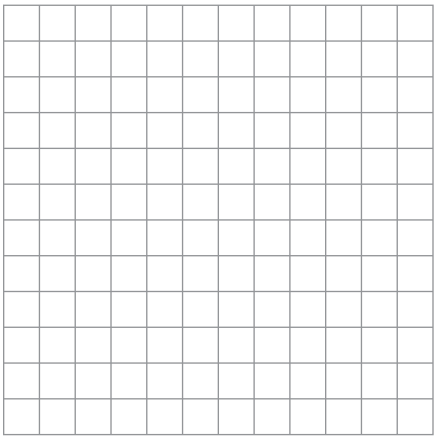


7. Graph each indirect variation function on the grid.

a. $y = \frac{1}{x}$

b. $y = \frac{1}{(x + 3)}$

c. $y = \frac{1}{(x - 3)}$

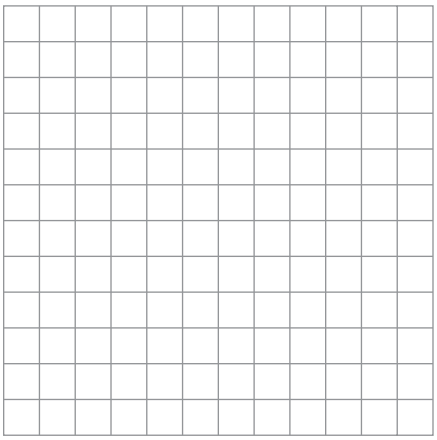


8. Graph each linear function on the grid.

a. $y = -x$

b. $y = -(x + 3)$

c. $y = -(x - 3)$

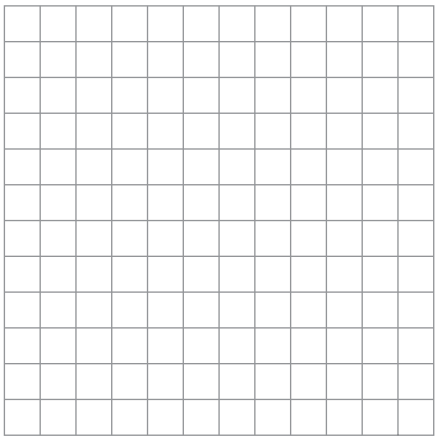


9. Graph each cubic function on the grid.

a. $y = x^3$

b. $y = (x + 3)^3$

c. $y = (x - 3)^3$



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10. In Questions 7 through 9, part (a) is a basic function.

a. Describe how adding 3 within the parentheses changed each graph in part (b).

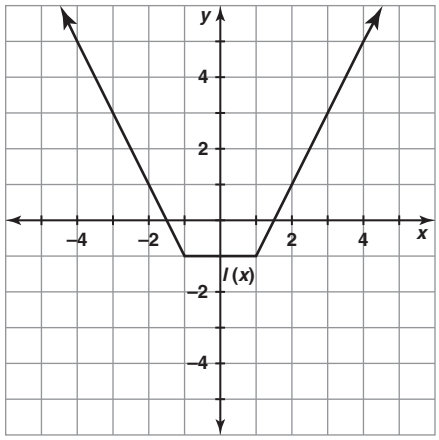
b. Describe how subtracting 3 within the parentheses changed each graph in part (c).

11. Compare Question 3 to Question 8. What is the difference between the equations in each part of Question 3 and those in the corresponding parts of Question 8? What is the difference between the graphs? Explain.

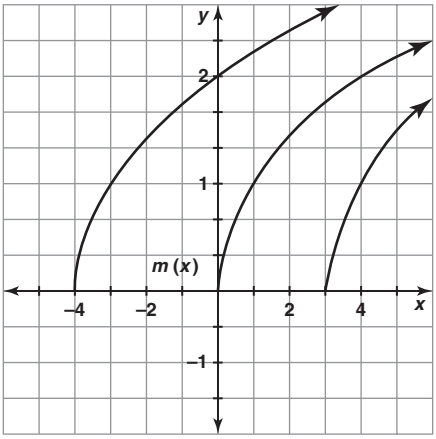
12. The graph of a function $l(x)$ is shown. Sketch the graph of

a. $l(x + 4)$

b. $l(x - 3)$



13. The graph of the function $m(x)$ is shown. Write a function in terms of $m(x)$ for each horizontal translation shown.



Assignment

Name _____ Date _____

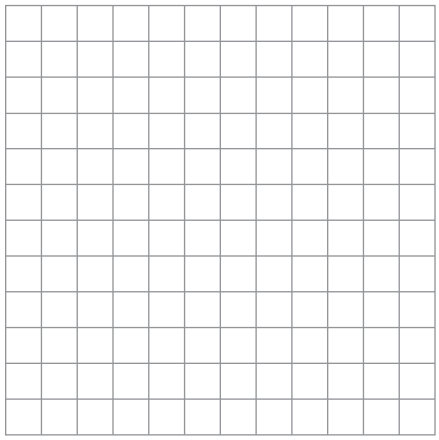
Expanding, Contracting, and Mirroring Dilations and Reflections

1. Graph each quadratic function on the grid.

a. $n(x) = -x^2$

b. $p(x) = -2x^2$

c. $q(x) = -\frac{1}{2}x^2$



2. Complete the table to calculate the rate of change from $x = 0$ to $x = 1$ for each function in Question 1.

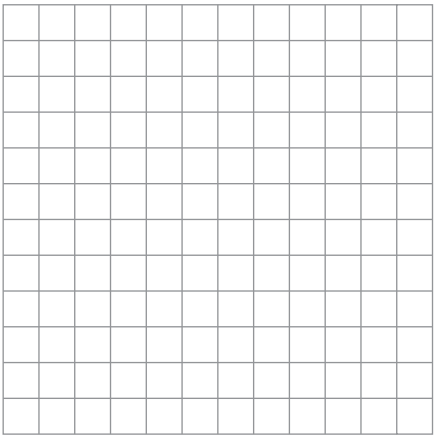
Function	Value at $x = 0$	Value at $x = 1$	Rate of change
$n(x) = -x^2$	$n(0) =$	$n(1) =$	$\frac{\triangle n(x)}{\triangle x} =$
$p(x) = -2x^2$	$p(0) =$	$p(1) =$	$\frac{\triangle p(x)}{\triangle x} =$
$q(x) = -\frac{1}{2}x^2$	$q(0) =$	$q(1) =$	$\frac{\triangle q(x)}{\triangle x} =$

3. Graph each cubic function on the grid.

a. $r(x) = x^3$

b. $s(x) = 2x^3$

c. $t(x) = \frac{1}{2}x^3$



4. Complete the table to calculate the rate of change from $x = 0$ to $x = 1$ for each function in Question 3.

Function	Value at $x = 0$	Value at $x = 1$	Rate of change
$r(x) = x^3$	$r(0) =$	$r(1) =$	$\frac{\triangle r(x)}{\triangle x} =$
$s(x) = 2x^3$	$s(0) =$	$s(1) =$	$\frac{\triangle s(x)}{\triangle x} =$
$t(x) = \frac{1}{2}x^3$	$t(0) =$	$t(1) =$	$\frac{\triangle t(x)}{\triangle x} =$

5. In Questions 1 and 3, part (a) is a basic function.

a. Describe how multiplying by 2 changed each graph in part (b).

b. Describe how multiplying by $\frac{1}{2}$ changed each graph in part (c).

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6. For Questions 2 and 4

a. Describe how multiplying the original function by 2 changed each rate of change.

b. Describe how multiplying the original function by $\frac{1}{2}$ changed each rate of change.

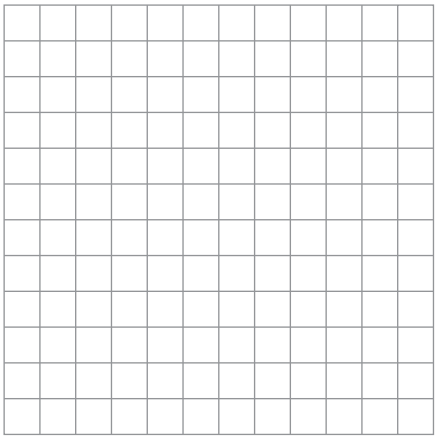
7. Graph each function on the grid shown.

a. $u(x) = x + 2$

b. $v(x) = -x + 2$

c. $w(x) = 2^x$

d. $y(x) = 2^{-x}$



8. For Question 7,

a. write $v(x)$ in terms of $u(x)$.

b. write $y(x)$ in terms of $w(x)$.

9. What is the line of reflection for the graphs in Question 7?

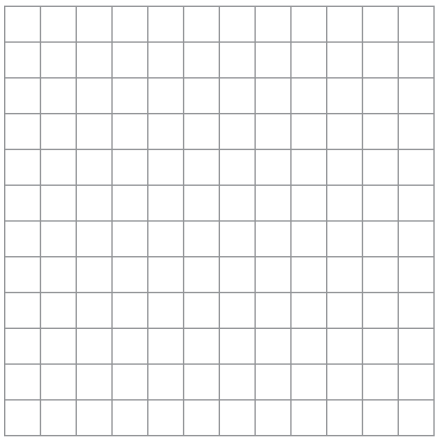
10. Graph each function on the grid shown.

a. $e(x) = x + 2$

b. $f(x) = -(x + 2)$

c. $g(x) = x^2$

d. $h(x) = -x^2$



11. For Question 10,

a. write $f(x)$ in terms of $e(x)$.

b. write $h(x)$ in terms of $g(x)$.

12. What is the line of reflection for the graphs in Question 7?

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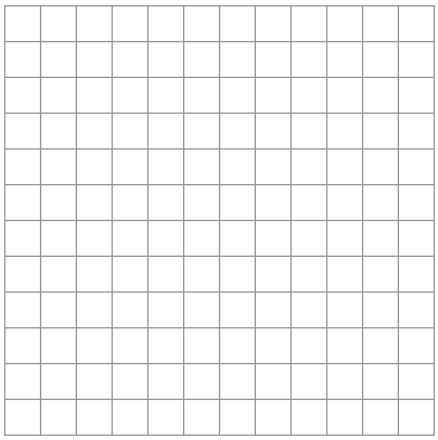
13. Graph each function on the grid shown.

a. $j(x) = 2^x$

b. $k(x) = -2^{-x}$



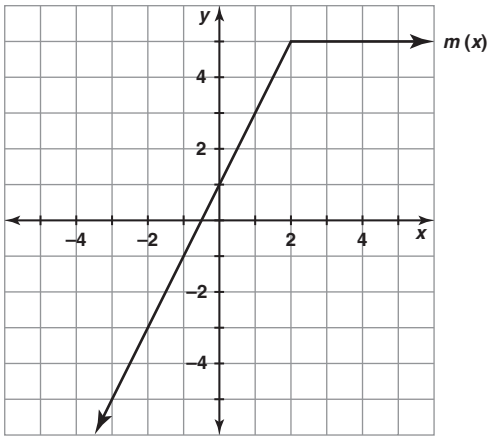
14. In Question 13, write $k(x)$ in terms of $j(x)$.

15. The graph of $m(x)$ is shown. Sketch the graph of

a. $n(x) = m(-x)$

b. $p(x) = -m(x)$

c. $q(x) = -m(-x)$



9

Assignment

Name _____ Date _____

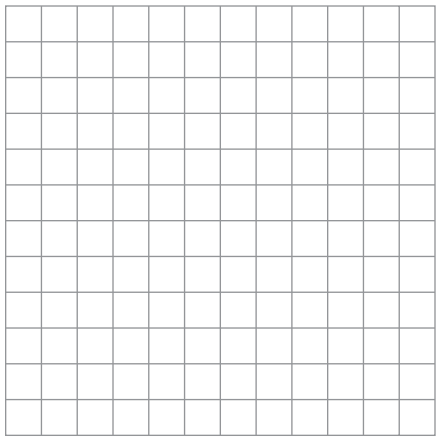
Mirroring!
Symmetry and Odd/Even

1. Graph each quadratic function on the grid.

a. $a(x) = -x^2$

b. $b(x) = -x^2 + x + 6$

c. $c(x) = -x^2 - x + 6$



2. For each function in Question 1, identify the vertex, *y*-intercept, *x*-intercept(s), and line of symmetry.

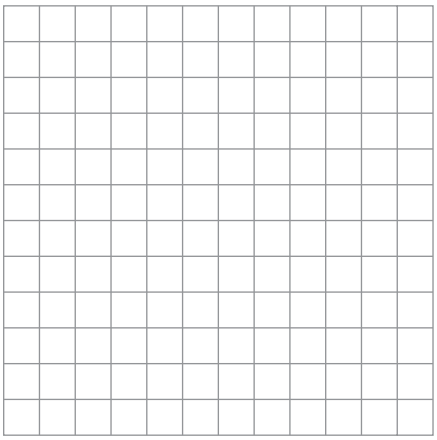
Function	Vertex	*y*-intercept	*x*-intercept(s)	Line of symmetry
$a(x) = -x^2$				
$b(x) = -x^2 + x + 6$				
$c(x) = -x^2 - x + 6$				

3. Graph each absolute value function on the grid.

a. $d(x) = |x|$

b. $e(x) = |x + 2| - 1$

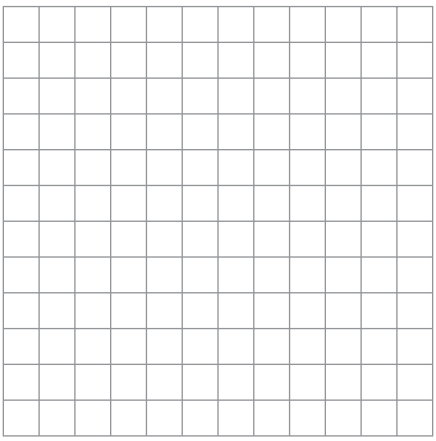
c. $f(x) = |x - 2| + 1$



4. For each function in Question 2, identify the vertex, *y*-intercept, *x*-intercept(s), and line of symmetry.

Function	Vertex	*y*-intercept	*x*-intercept(s)	Line of symmetry
$d(x) = \|x\|$				
$e(x) = \|x + 2\| - 1$				
$f(x) = \|x - 2\| + 1$				

5. Identify the equation of the line of symmetry, if it exists, for each graph shown.



a. Line of symmetry of $g(x)$:

b. Line of symmetry of $h(x)$:

c. Line of symmetry of $j(x)$:

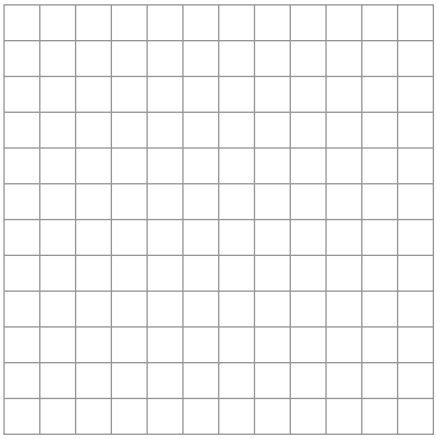
6. Graph each function on the grid shown.

a. $k(x) = x^2 + 2$

b. $l(x) = x^3 + 2x$

c. $m(x) = x^4 - 2x^2$

d. $n(x) = x^5 - 2x^3$



7. In Question 6, which functions are even?

8. Describe the result of reflecting the graphs of the functions in Question 7 about the *y*-axis.

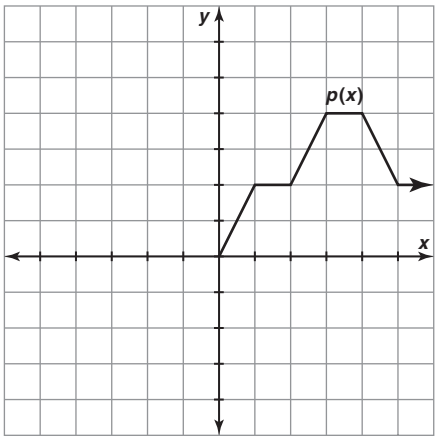
9. In Question 6, which functions are odd?

10. Describe the result of reflecting the graphs of the functions in Question 9 about the *y*-axis and then about the *x*-axis.

11. The portion of the graph of $p(x)$ to the right of the y-axis is shown. Sketch the portion of the graph to the left of the y-axis if

a. the function is an even function.

b. the function is an odd function.



Assignment

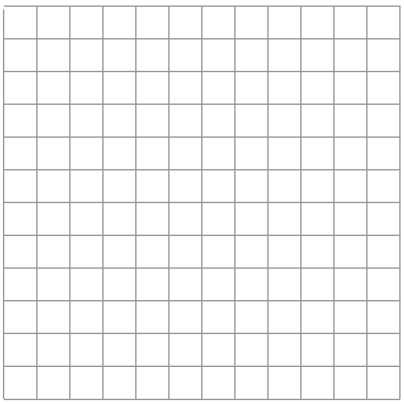
Name _____ Date _____

Machine Parts
Solving Equations Graphically

Dave bakes cranberry muffins in batches. He starts the first batch after preparing the batter, which takes him 50 minutes. After that, each batch takes 30 minutes to bake. In comparison to Dave, Stefannie uses a different recipe to make cranberry muffins. Preparing the batter takes her 30 minutes, and each batch takes her 40 minutes. Use this information to answer Questions 1 through 11.

1. Define variables for the independent and dependent quantities. Then write equations for the total time it takes Dave and Stefannie each to bake a given number of batches of cranberry muffins.

2. Graph the equations in Question 1 on the grid shown.



3. Does it make sense to connect the points of each graph? Explain.

4. Identify the slope and *y*-intercept for each function. What do the slope and *y*-intercepts mean in terms of the situation?

5. If Dave and Stefannie each bake 2 batches of muffins, calculate the time it takes each of them. Who takes less time? Explain.

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6. If Dave and Stefannie each bake fewer than 2 batches, who takes less time?

7. If Dave and Stefannie each bake more than 2 batches, who takes less time?

8. Complete the table.

Number of batches of muffins (batches)	Time it takes Dave (minutes)	Time it takes Stefannie (minutes)
x		
1		
2		
3		
4		
5		
6		
7		

9. Use the table of values to determine the point(s) of intersection. How did you find the point(s) of intersection in the table?

10. Use the graph in Question 2 to determine the point(s) of intersection. How did you find the point(s) of intersection on the graph?

11. Use the equations to solve for the point(s) of intersection algebraically.

Use the equation $x^3 = 7x^2 - 10x$ to answer Questions 12 through 14.

12. To solve the equation $x^3 = 7x^2 - 10x$ graphically, define the function $a(x)$ to equal the left side of the equation, and the function $b(x)$ to equal the right side of the equation.

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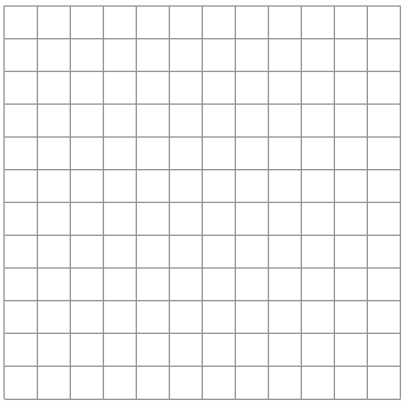
13. Use a table of values to determine the point(s) of intersection of $a(x)$ and $b(x)$. What is the solution(s) to the equation $x^3 = 7x^2 - 10x$?

x		
0		
1		
2		
3		
4		
5		
6		
7		
8		

14. Use a graph to determine the points of intersection of $a(x)$ and $b(x)$. What is the solution(s) to the equation $x^3 = 7x^2 - 10x$?



15. Consider the equation $x^2 = 4x - 3$.

a. Define the function $c(x)$ equal to the left side of the equation and the function $d(x)$ equal to the right side of the equation.

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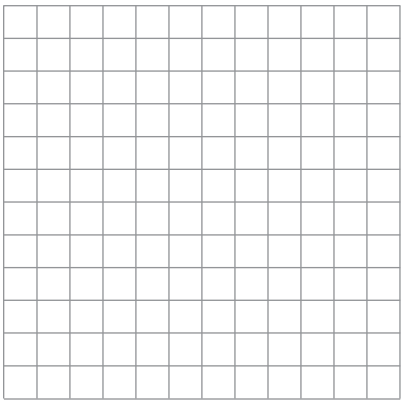
b. Graph the functions $c(x)$ and $d(x)$ from part (a).



c. Are the functions $c(x)$ and $d(x)$ consistent or inconsistent?

d. If possible, determine the solution(s) to the equation $x^2 = 4x - 3$.