Grade 6 Math Circles

February 7/8/9, 2023

Functions, Relations, and Graphing - Solutions

Exercise Solutions

Exercise 1

Classify each of the relations as a function or not a function.

a)

Input	Output
0	5
3	6
3	7
6	10

b)

Input	Output
-10	14
-5	0
0	6
2	2

c)

Input	Output
-5	4
0	7
3	14
10	4

Exercise 1 Solution

a) Not a function since 3 has two different outputs.

b) Function since each input has only one output.

c) Function since each input has only one output.

Exercise 2

Find the outputs of the function $y = 3x - 2$ given the following inputs.

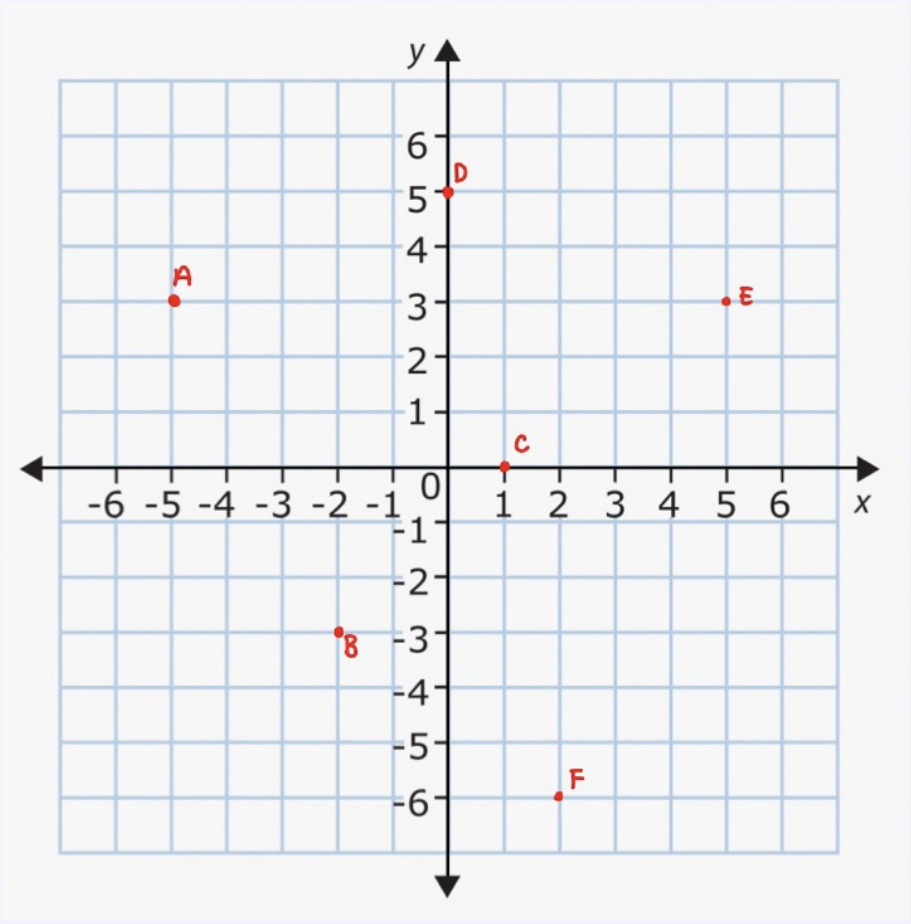
a) $x = 0$ b) $x = 1$ c) $x = -5$ d) $x = 10$ e) $x = -7$

Exercise 2 Solution

a) $y = -2$ b) $y = 1$ c) $y = -17$ d) $y = 28$ e) $y = -23$

Exercise 3

Write the coordinates for each of the points on the following Cartesian Plane:



Exercise 3 Solution

$A : (-5, 3)$ $B : (-2, -3)$ $C : (1, 0)$ $D : (0, 5)$ $E : (5, 3)$ $F : (2, -6)$

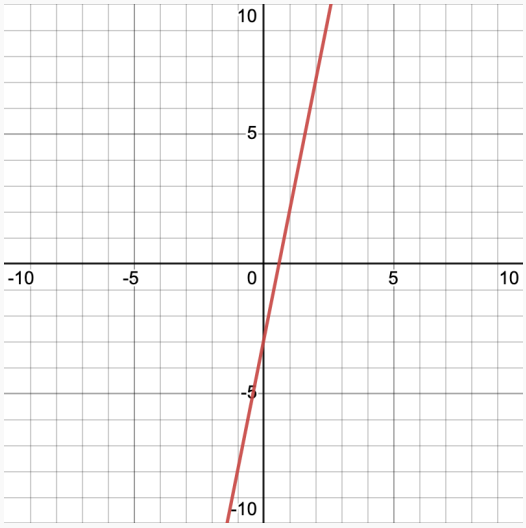
Exercise 4

Create a table with 5 to 8 x-coordinates and find the corresponding y-coordinates for each function. Then, plot the points and connect the dots to find the graph.

a) $y = 5x - 3$ b) $y = x^2 + 4$ c) $y = 5$ d) $y = 3x^2$

Exercise 4 Solution

a)



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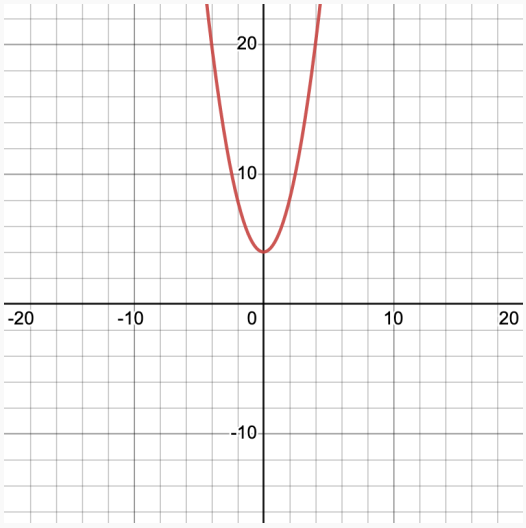

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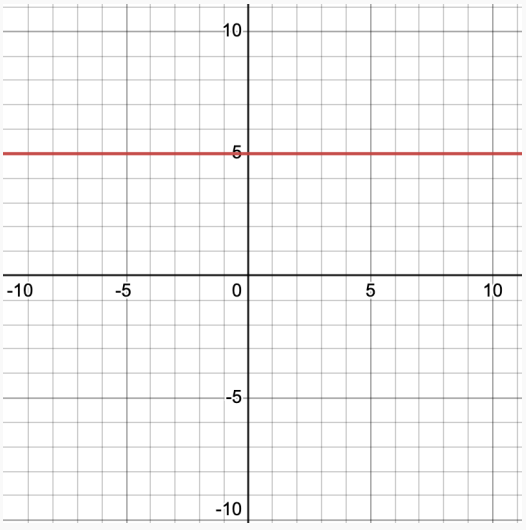

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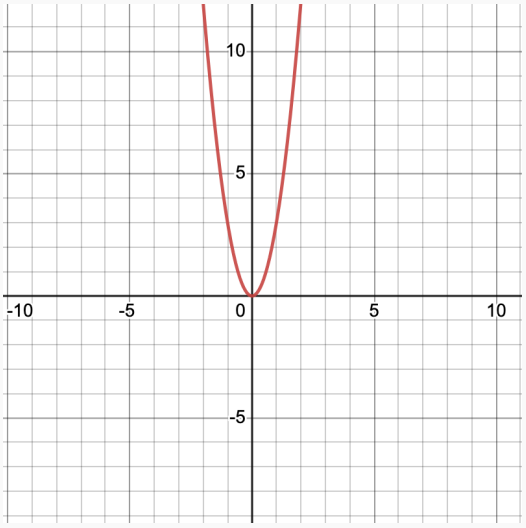


Exercise 5

Find the slopes and y-intercepts in each of the examples above.

Exercise 5 Solution

Slopes (from left to right): 4, -1, $\frac{3}{2}$, -3

y-intercepts (from left to right): -3, 1, $-\frac{5}{3}$, 5

Exercise 6

Find the vertices in each of the examples above.

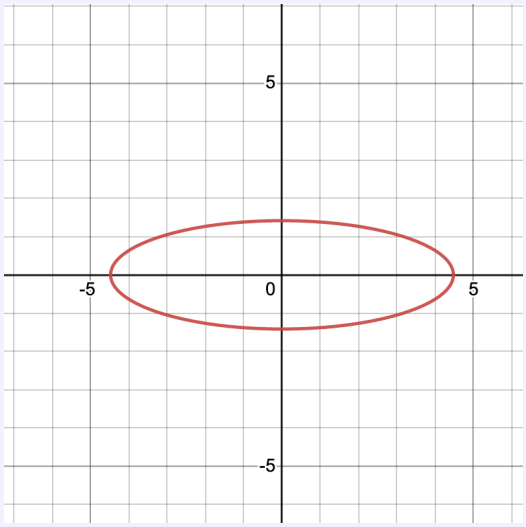
Exercise 6 Solution

$(-1,-7)$, $(0,2)$, $(1,0)$,$(0,0)$

Exercise 7

Determine whether the following graphs are functions or not using the vertical line test.

a)



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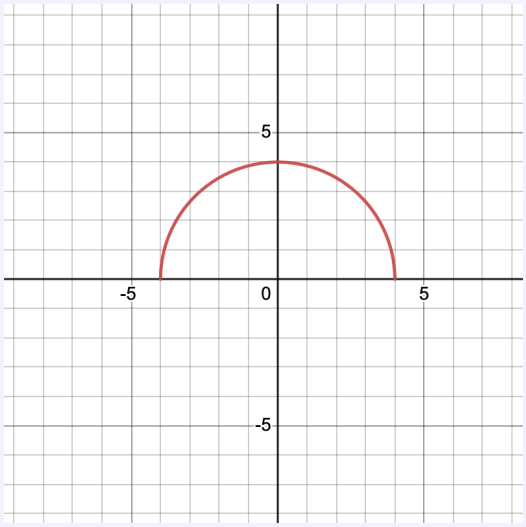

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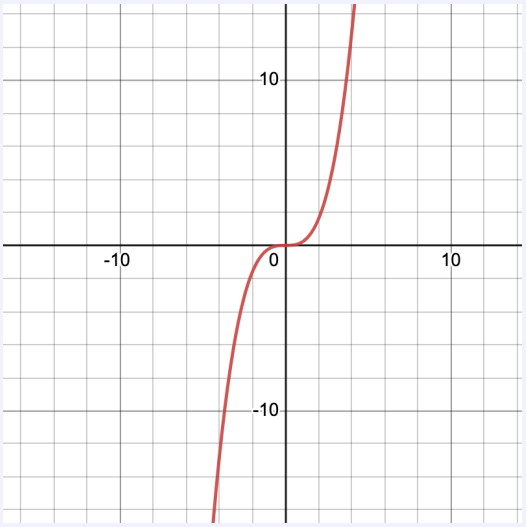

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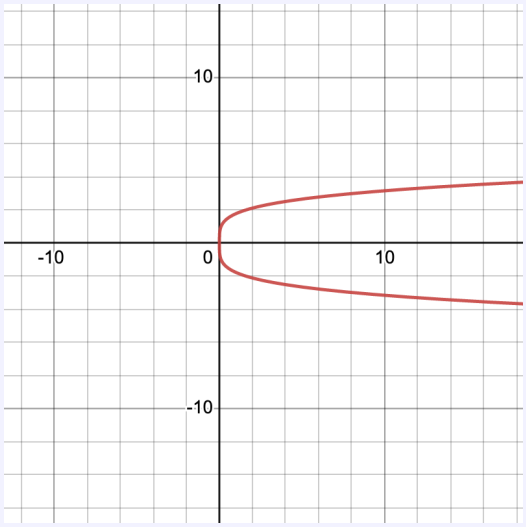


Exercise 7 Solution

a) Not a function b) Function c) Function d) Not a function

Problem Set Solutions

1. Classify each of the following relations as a function or not a function. How do you know?

a)

x	y
-5	0
-4	1
-3	2
-2	3

b)

x	y
-8	16
0	20
4	5
-8	3

c)

x	y
20	6
86	6
-30	6
-6	6

d)

x	y
-5	21
-3	5
0	9
-5	21

e)

x	y
4	2
4	4
5	6
5	8

Solution:

a) Function since each input has only one output.

b) Not a function since -8 has two different outputs.

c) Function since each input has only one output.

d) Function since each input has only one output.

e) Not a function since both 4 and 5 each have two different outputs.

2. Sketch the following functions.

a) $y = 2x$

b) $y = 5x + 2$

c) $y = -4x^2 + 3$

d) $y = x^2 - 2$

e) $y = 8$

Solution:

Sketches can be checked on Desmos.

3. State whether the following functions are linear functions, quadratic functions, or neither.

a) $y = 3x^2 + 2$

b) $y = -x^2 + 3x - 1$

c) $y = 0$

d) $y = x$

e) $y = x^3$

f) $y = 3$

g) $y = 6 + 3x - x^2$

h) $y = 4x^4 + 3x$

Solution:

a) Quadratic

b) Quadratic

c) Linear

d) Linear

e) Neither

f) Linear

g) Quadratic

h) Neither

4. For each of the following linear functions, state the slope and the y-intercept.

a) $y = x + 1$

b) $y = -15x$

c) $y = 3x - 18$

d) $y = \frac{2}{3}x + 21$

e) $y = -\frac{1}{2}$

Solution:

a) Slope: 1, y-intercept: 1

b) Slope: -15, y-intercept: 0

c) Slope: 3, y-intercept: -18

d) Slope: $\frac{2}{3}$, y-intercept: 21

e) Slope: 0, y-intercept: $-\frac{1}{2}$

5. For each of the following quadratic functions, determine whether the parabola opens up or down and state the y-intercept.

a) $y = -x^2 + 2x - 8$

b) $y = 3x^2 + 1$

c) $y = x^2$

d) $y = -5x^2 + 8x + 3$

e) $y = 2x^2 + 2$

Solution:

a) Opens down, y-intercept: -8

b) Opens up, y-intercept: 1

c) Opens up, y-intercept: 0

d) Opens down, y-intercept: 3

e) Opens up, y-intercept: 2

6. Give an example for each of the following types of functions. Create a table of x-coordinates to find corresponding y-coordinates and use this to sketch the graph.

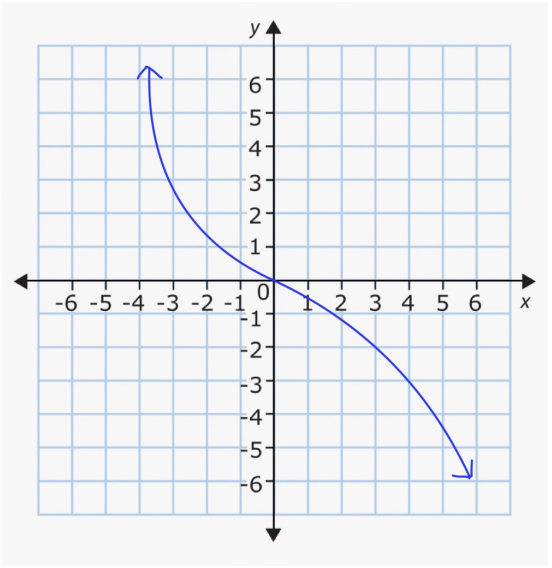
a) Linear function

b) Quadratic function

Solution: Solutions will vary.

7. Determine whether each graph is a function or not a function by the vertical line test.

a)



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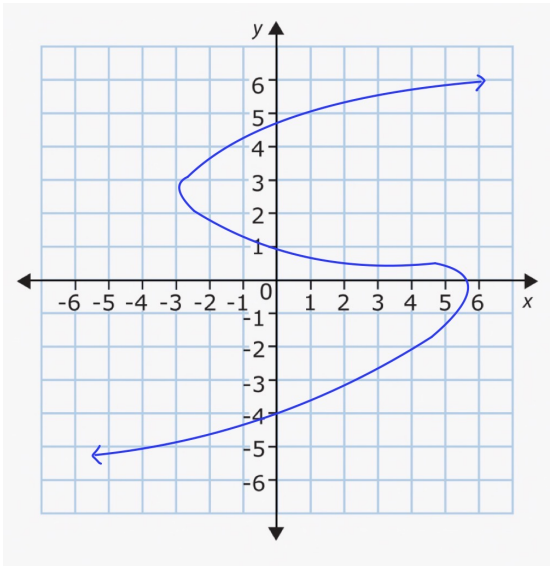

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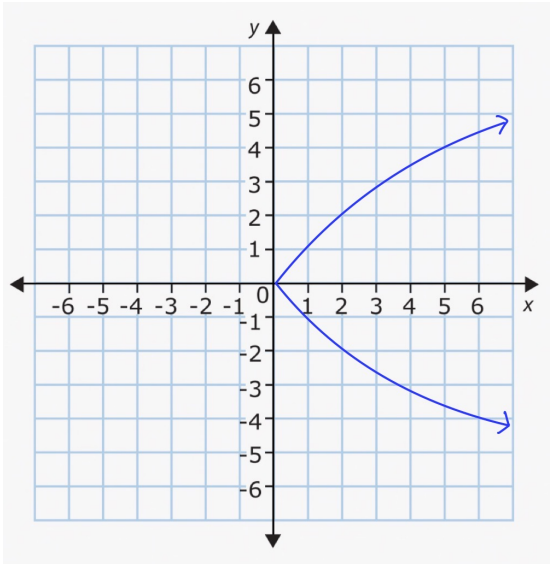

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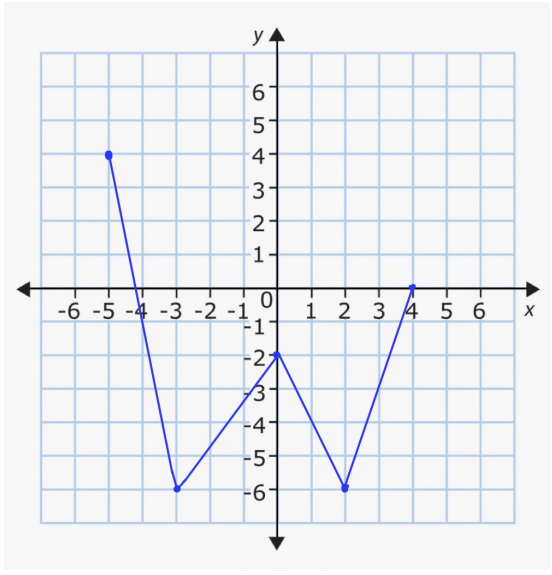

Solution: a) Function b) Not a function c) Not a function d) Function