

Algebra 1

7. Absolute Value Functions

7.1 Graphing Absolute Value Functions

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Exercises

Find all solutions to exercises via

https://mathleaks.com/study/graphing_absolute_value_functions or scan the QR code



1.1 Find the absolute values.

A $|-7|$

B $|19|$

C $|-1.25|$

1.2 Determine the absolute values

when $x = 2$.

A $|x + 8|$

B $|-5x + 1|$

C $|(-x)^3|$

1.3 Calculate the value of the expressions.

A $|-8| + |2|$

B $|5| + |-29|$

C $|-4| - |-6|$

1.4 Draw the graphs of the following functions.

A $y = |x|$

B $y = -|x|$

1.5 Graph the absolute value function $f(x) = 2|x| - 2$.

1.6 Graph the absolute value function $f(x) = |x + 4| - 4$.

1.7 Graph the absolute value function $f(x) = |x - 4|$.

1.8 Graph $y = |5x|$ by making a table of values.

1.9 Graph the function
 $f(x) = -|x + 3| - 2$.

1.10 Consider the following absolute value function.

$$y = |x| - 3$$

Find where the function is increasing and where it is decreasing.

1.11 Graph the absolute value function $f(x) = -\frac{3}{5}|x|$.

1.12 Graph the function
 $f(x) = |3x + 6| + 3$. What is the function's domain and range?

1.13 Consider the function
 $f(x) = |3x| + 2$.

A Make a table of values where x is all integers from -4 to 4, inclusive.

B Plot the points on a coordinate plane.

C Graph the function.

1.14 Graph the function

$$f(x) = -\frac{3}{4}|x + 4| - 2$$

1.15 Consider the function

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

A Make a table of values where x is all integers from -4 to 4, inclusive.

B Plot the points on a coordinate plane.

C Graph the function.

1.16 **A** Graph the absolute value function $f(x) = -3|x - 2| + 3$

B Find the function's vertex, the point where the graph changes direction.

C Find the function's domain and range.

D Find the function's x - and y -intercepts.

1.17 Graph the absolute value function $y = \left| \frac{1}{3}x + 1 \right|$ and find its domain and range.

- 2.1** **A** Draw the graph of the absolute value function

$$y = |x - 4| + 2.$$

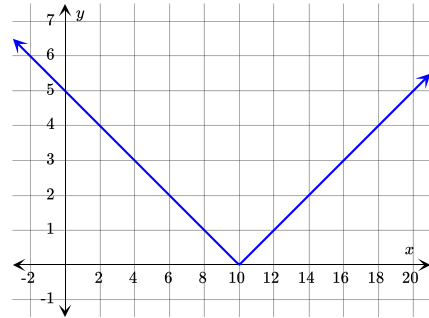
- B** Find the absolute value function's vertex, the point where the graph changes direction.
-

- C** There is a relationship between the vertex and the function rule. Find this relationship and use it to determine the vertex of any function which can be written on the form $y = |x - h| + k$.

- 2.2** Draw the graphs of $f(x) = |x - 3| + 2$ and $g(x) = |x + 5| - 2$. Do the graphs have any point(s) in common?

- 2.3** Do the graphs of $f(x) = |x| - 7$ and $g(x) = -|x - 3|$ have any point(s) in common?

- 2.4** Find a function rule for the absolute value function graphed in the diagram.



- 2.5** Graph $y = 2|x + 1| - 5$ and $y = -1$ in the same coordinate plane. Use the graph to solve the equation $2|x + 1| - 5 = -1$.

- 2.6** The country with the tallest population in the world is the Netherlands. Dutch men are on average 182.5 cm tall. Write an absolute value function describing the difference between the height of an average Dutch male and an individual with an unknown height.

- 2.7** Draw the graph of the absolute value function $y = |2x| - 4$. Then use the graph to rewrite the absolute value function as two linear functions, one with the domain $x < 0$ and the other with the domain $x \geq 0$.

2.8 Draw the graph of the absolute value function $y = |-3x|$. Then use the graph to rewrite the absolute value function as two linear functions, one with the domain $x < 0$ and the other with the domain $x \geq 0$.

2.9 In one section of Barkley Marathons the runners must first run up and then run down Jaque Mate Hill. The Hill's shape and height can be modeled using the function $h(x) = -\frac{1}{4}|x - 1600| + 400$ where h and x are in meters.

A If $0 \leq x \leq 3200$, find the slope for the uphill and for the downhill portion of Jaque Mate Hill.

B Graph this function. What are the domain and range?

2.10 The amount of ore produced daily, measured in metric tons, by the Daniel Heaton Silver Mine during its 40 years of existence can be modeled using the function

$$m(t) = -3|t - 10| + 100.$$

A Graph the function.

B What is the highest amount of ore that was extracted daily from the mine.

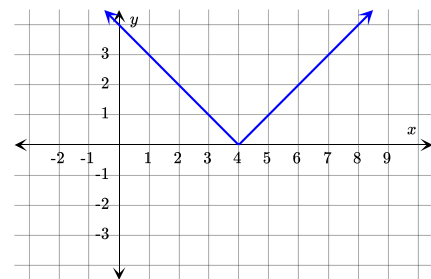
3.1 Graph the functions

$$g(x) = \frac{1}{2}|x|, g(x) = \left| \frac{1}{2}x \right|,$$

$$g(x) = -\frac{1}{2}|x|, \text{ and}$$

$g(x) = \left| -\frac{1}{2}x \right|$, from $x = -6$ to $x = 6$, and then compare the graphs.

3.2 In the diagram is the graph of the function $y = |g(x)|$.



Find $g(x)$.

Answers

7.1 Graphing Absolute Value Functions

1.1 **A** 7

B 19

C 1.25

1.2 **A** 10

B 9

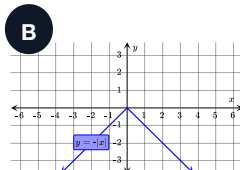
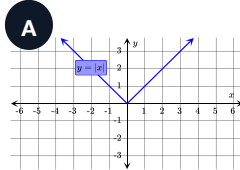
C 8

1.3 **A** 10

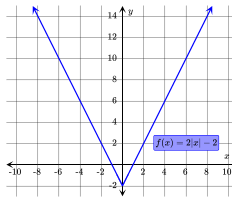
B 34

C -2

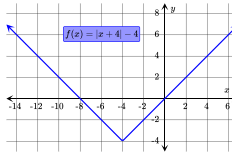
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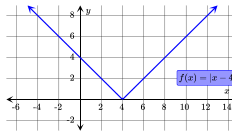
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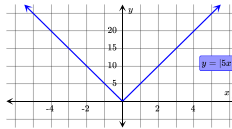
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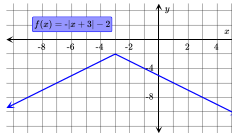
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1.8

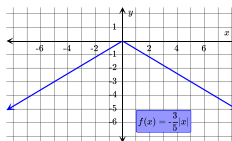


1.9

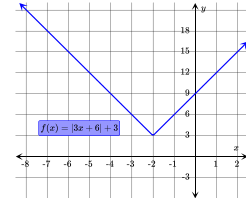


1.10 $x < 0$: the function decreases
 $x > 0$: the function increases

1.11



1.12 Graph:



Domain: All real numbers.

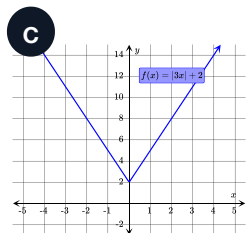
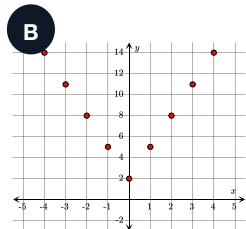
Range: $y \geq 3$

1.13

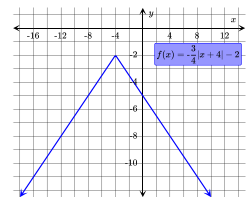
A

$$f(x) = |3x + 2|$$

x	f(x)
-4	14
-3	11
-2	8
-1	5
0	2
1	5
2	8
3	11
4	14



1.14

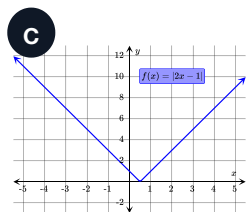
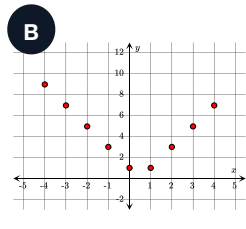


1.15

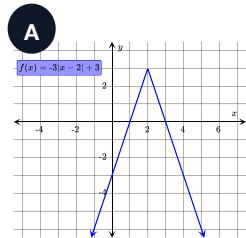
A

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

x	f(x)
-4	9
-3	7
-2	5
-1	3
0	1
1	1
2	3
3	5
4	7



1.16



B (2, 3)

C Domain: All real numbers.

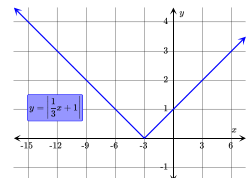
Range: $y \leq 3$

D x-intercepts:

1 and 3

y-intercept: -3

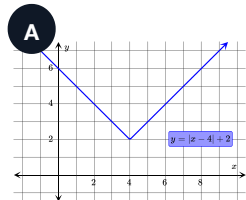
1.17 Graph:



Domain: All real numbers.

Range: $y \geq 0$

2.1



B (4, 2)

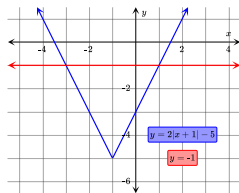
C (h, k)

2.2 Point in common: (1, 4)

2.3 (5, -2) and (-2, -5)

2.4 $y = \left| \frac{1}{2}x - 5 \right|$

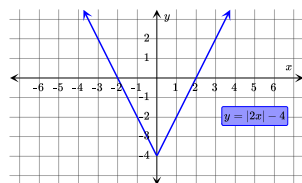
2.5 Graph:



Solutions: $x = -3$
and $x = 1$

2.6 $f(x) = |x - 182.5|$

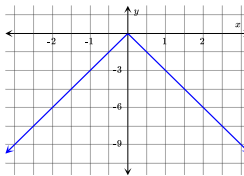
2.7 Graph:



Functions:

$$y = \begin{cases} -2x - 4 & \text{when } x < 0 \\ 2x - 4 & \text{when } x \geq 0 \end{cases}$$

2.8 Graph:



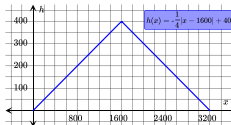
Functions:

$$y = \begin{cases} 3x & \text{when } x < 0 \\ -3x & \text{when } x \geq 0 \end{cases}$$

2.9 **A** Slope for the uphill portion of the hill: $\frac{1}{4}$

Slope for the downhill portion of the hill: $-\frac{1}{4}$

B Graph:



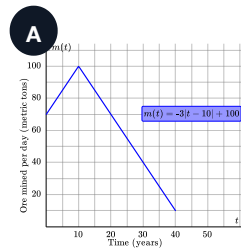
Domain: $0 \leq$

$x \leq 3200$

Range: $0 \leq h \leq$

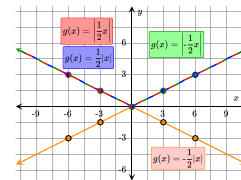
400

2.10



B 100 metric tons per day.

3.1 Graph:



Comparison: See solution.

3.2 $g(x) = -x + 4$ or $g(x) = x - 4$