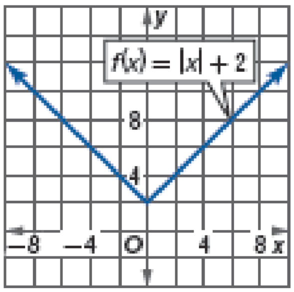
Name: Jeff Denney School: Spain Park High School Grade: 12 Class: PreCalculus

1-2 Analyzing Graphs of Functions and Relations - A Exercises 1-15

Use the graph of each function to estimate the indicated function values. Then confirm the estimate algebraically. Round to the nearest hundredth, if necessary.

3.



a. $f(-8)$
b. $f(-3)$
c. $f(0)$

The function value at $x = -8$ appears to be about 10. To confirm this estimate algebraically, find $f(-8)$.

$$\begin{aligned} f(x) &= |x| + 2 \\ f(-8) &= |-8| + 2 \\ &= 8 + 2 \\ &= 10 \end{aligned}$$

The function value at $x = -3$ appears to be about 5. Find $f(-3)$.

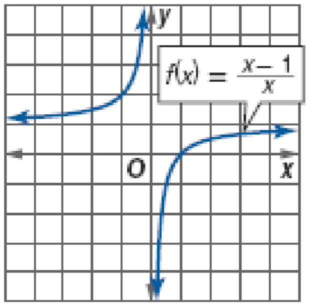
$$\begin{aligned} f(-3) &= |-3| + 2 \\ &= 3 + 2 \\ &= 5 \end{aligned}$$

The function value at $x = 0$ appears to be about 2. Find $f(0)$.

$$\begin{aligned} f(0) &= |0| + 2 \\ &= 2 \end{aligned}$$

a. 10
b. 5
c. 2

Name: Jeff Denney School: Spain Park High School Grade: 12 Class: PreCalculus

5. 

a. $f(-3)$
b. $f(0.5)$
c. $f(0)$

The function value at $x = -3$ appears to be about 1.5. To confirm this estimate algebraically, find $f(-3)$.

$$f(x) = \frac{x-1}{x}$$
$$f(-3) = \frac{-3-1}{-3}$$
$$= \frac{-4}{-3} \text{ or about } 1.3$$

The function value at $x = 0.5$ appears to be about -1. Find $f(0.5)$.

$$f(x) = \frac{x-1}{x}$$
$$f(0.5) = \frac{0.5-1}{0.5}$$
$$= \frac{-0.5}{0.5} \text{ or } -1$$

The function value at $x = 0$ appears to be undefined. Find $f(0)$.

$$f(x) = \frac{x-1}{x}$$
$$f(0) = \frac{0-1}{0}$$

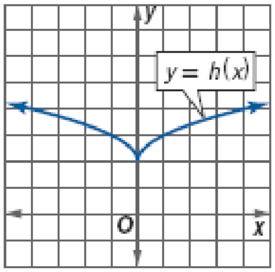
Because division by zero is undefined, $f(0)$ is undefined.

a. $\frac{4}{3}$
b. -1
c. undefined

Use the graph of *h* to find the domain and range of each function.

Name: Jeff Denney   School: Spain Park High School   Grade: 12   Class: PreCalculus

9.

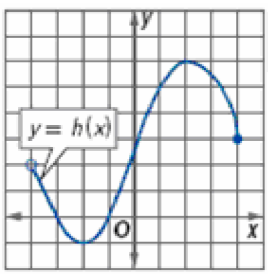


The arrows on the left and right sides of the graph indicate that the graph will continue without bound in both directions. Therefore, the domain of h is $(-\infty, \infty)$.

The graph does not extend below $h(0)$ or 2, but $h(x)$ increases without bound for greater and greater values of x. So, the range of h is $[2, \infty)$.

D = $(-\infty, \infty)$, R = $[2, \infty)$

11.



The open dot at (–4, 2) indicates that $x = -4$ is not in the domain of h, and the closed dot at (4, 3) indicates that $x = 4$ is in the domain. Therefore, the domain of h is D = $(-4, 4]$.

The graph does not extend below $h(-2) = -1$ or above $h(2) = 6$. So, the range of h is $[-1, 6]$.

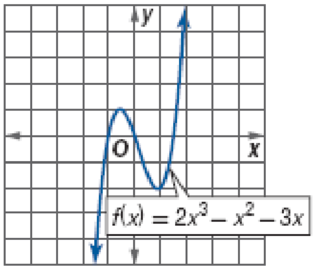
D = $(-4, 4]$, R = $[-1, 6]$

1-2 Analyzing Graphs of Functions and Relations - A Exercises 16-41

Use the graph of each function to find its *y*-intercept and zero(s). Then find these values algebraically.

Name: Jeff Denney School: Spain Park High School Grade: 12 Class: PreCalculus

17.



From the graph, it appears that $f(x)$ intersects the y-axis at approximately (0, 0), so the y-intercept is 0. Find $f(0)$.

$f(x) = 2x^3 - x^2 - 3x$
$f(0) = 2(0)^3 - (0)^2 - 3(0)$
$f(0) = 0$

Therefore, the y-intercept is 0.

From the graph, the x-intercepts appear to be at about –1 and $\frac{3}{2}$. Let $f(x) = 0$ and solve for x.

$$2x^3 - x^2 - 3x = 0$$
$$x(2x-3)(x+1) = 0$$
$$x = 0 \text{ or } 2x - 3 = 0 \text{ or } x + 1 = 0$$
$$x = \frac{3}{2} \qquad x = -1$$

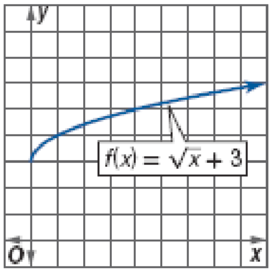
Therefore, the zeros of f are 0, $\frac{3}{2}$, and –1.

y-intercept: 0; zeros: –1, 0, $\frac{3}{2}$;

$$2x^3 - x^2 - 3x = 0$$
$$x(2x-3)(x+1) = 0$$
$$x = 0 \text{ or } 2x - 3 = 0 \text{ or } x + 1 = 0$$
$$x = \frac{3}{2} \qquad x = -1$$

Name: Jeff Denney   School: Spain Park High School   Grade: 12   Class: PreCalculus

19.



From the graph, it appears that $f(x)$ intersects the y-axis at approximately (3, 0), so the y-intercept is 3. Find $f(0)$.

$f(x) = \sqrt{x} + 3$
$f(0) = \sqrt{0} + 3$
$f(0) = 3$

Therefore, the y-intercept is 3.

From the graph, it appears that there are no x-intercepts. Let $f(x) = 0$ and solve for x.

$\sqrt{x} + 3 = 0$
$\sqrt{x} \neq -3$

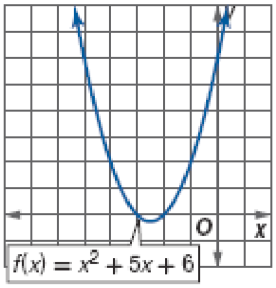
The square root of x cannot equal a negative number. Therefore, there are no zeros.

y-intercept: 3; no zeros;

$\sqrt{x} + 3 = 0$
$\sqrt{x} \neq -3$

Name: Jeff Denney School: Spain Park High School Grade: 12 Class: PreCalculus

23.



From the graph, it appears that $f(x)$ intersects the y-axis at approximately (0, 6), so the y-intercept is 6. Find $f(0)$.

$$f(x) = x^2 + 5x + 6$$
$$f(0) = (0)^2 + 5(0) + 6$$
$$f(0) = 6$$

Therefore, the y-intercept is 6.

From the graph, the x-intercepts appear to be at about –2 and –3. Let $f(x) = 0$ and solve for x.

$$x^2 + 5x + 6 = 0$$
$$(x+2)(x+3) = 0$$
$$x + 2 = 0 \quad \text{or} \quad x + 3 = 0$$
$$x = -2 \qquad\qquad x = -3$$

Therefore, the zeros of f are –2 and –3.

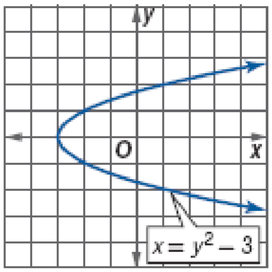
y-intercept: 6; zeros: −2, −3;

$$x^2 + 5x + 6 = 0$$
$$(x+2)(x+3) = 0$$
$$x + 2 = 0 \quad \text{or} \quad x + 3 = 0$$
$$x = -2 \qquad\qquad x = -3$$

Use the graph of each equation to test for symmetry with respect to the *x*-axis, *y*-axis, and the origin. Support the answer numerically. Then confirm algebraically.

Name: Jeff Denney School: Spain Park High School Grade: 12 Class: PreCalculus

25.



The graph appears to be symmetric with respect to the x-axis because for every point (x, y) on the graph, there is a point $(x, -y)$. Make a table of values to support this conjecture.

x	y	(x, y)
1	2	(1, 2)
1	−2	(1, −2)
2	$\sqrt{5}$	$(2, \sqrt{5})$
2	$-\sqrt{5}$	$(2, -\sqrt{5})$
3	$\sqrt{6}$	$(3, \sqrt{6})$
3	$-\sqrt{6}$	$(3, -\sqrt{6})$

Because $x = (-y)^2 - 3$ is equivalent to $x = y^2 - 3$, the graph is symmetric with respect to the x-axis.

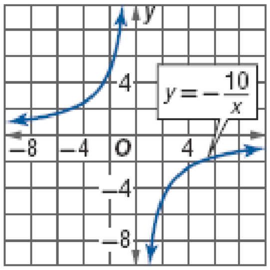
x-axis;

x	y	(x, y)
1	2	(1, 2)
1	−2	(1, −2)
2	$\sqrt{5}$	$(2, \sqrt{5})$
2	$-\sqrt{5}$	$(2, -\sqrt{5})$
3	$\sqrt{6}$	$(3, \sqrt{6})$
3	$-\sqrt{6}$	$(3, -\sqrt{6})$

Because $x = (-y)^2 - 3$ is equivalent to $x = y^2 - 3$, the graph is symmetric with respect to the x-axis.

Name: Jeff Denney School: Spain Park High School Grade: 12 Class: PreCalculus

29.



The graph appears to be symmetric with respect to the origin because for every point (x, y) on the graph, there is a point ($-x$, $-y$). Make a table of values to support this conjecture.

x	y	(x, y)
−10	1	(−10, 1)
−5	2	(−5, 2)
−1	10	(−1, 10)
1	−10	(1, −10)
5	−2	(5, −2)
10	−1	(10, −1)

Because $-y = -\frac{10}{(-x)}$ is equivalent to $y = -\frac{10}{x}$, the graph is symmetric with respect to the origin.

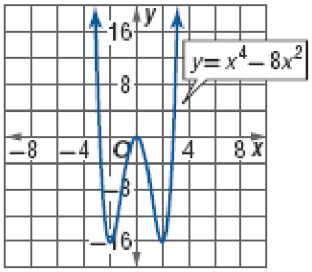
origin;

x	y	(x, y)
−10	1	(−10, 1)
−5	2	(−5, 2)
−1	10	(−1, 10)
1	−10	(1, −10)
5	−2	(5, −2)
10	−1	(10, −1)

Because $-y = -\frac{10}{(-x)}$ is equivalent to $y = -\frac{10}{x}$, the graph is symmetric with respect to the origin.

Name: Jeff Denney School: Spain Park High School Grade: 12 Class: PreCalculus

31.



The graph appears to be symmetric with respect to the y-axis because for every point (x, y) on the graph, there is a point $(-x, y)$. Make a table of values to support this conjecture.

x	y	(x, y)
−3	9	(−3, 9)
−2	−16	(−2, −16)
−1	−7	(−1, −7)
1	−7	(1, −7)
2	−16	(2, 16)
3	9	(3, 9)

Because $y = (-x)^4 - 8(-x)^2$ is equivalent to $y = x^4 - 8x^2$, the graph is symmetric with respect to the y-axis.

y-axis;

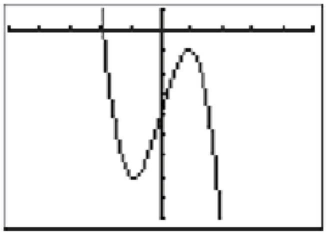
x	y	(x, y)
−3	9	(−3, 9)
−2	−16	(−2, −16)
−1	−7	(−1, −7)
1	−7	(1, −7)
2	−16	(2, 16)
3	9	(3, 9)

Because $y = (-x)^4 - 8(-x)^2$ is equivalent to $y = x^4 - 8x^2$, the graph is symmetric with respect to the y-axis.

GRAPHING CALCULATOR Graph each function. Analyze the graph to determine whether each function is *even*, *odd*, or *neither*. Confirm algebraically. If odd or even, describe the symmetry of the graph of the function.

Name: Jeff Denney   School: Spain Park High School   Grade: 12   Class: PreCalculus

35. $f(x) = -2x^3 + 5x - 4$

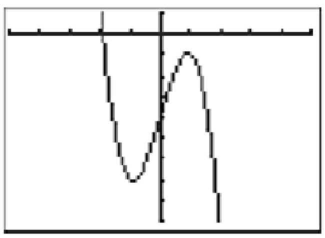


[−5, 5] scl: 1 by [−9, 1] scl: 1

It does not appear that the graph of the function is symmetric with respect to the *x*-axis, *y*-axis, or origin. Test this conjecture.

$$f(-x) = -2(-x)^3 + 5(-x) - 4$$
$$= -2x^3 - 5x - 4$$

The function is neither even nor odd because $f(-x) \neq f(x)$ and $f(-x) \neq -f(x)$.



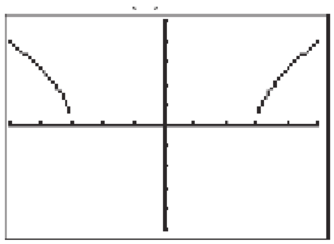
[−5, 5] scl: 1 by [−9, 1] scl: 1

neither;

$$f(-x) = -2(-x)^3 + 5(-x) - 4$$
$$= -2x^3 - 5x - 4$$

Name: Jeff Denney   School: Spain Park High School   Grade: 12   Class: PreCalculus

37. $h(x) = \sqrt{x^2 - 9}$

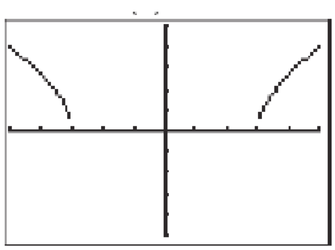


[−5, 5] scl: 1 by [−5, 5] scl: 1

It appears that the graph of the function is symmetric with respect to the y-axis. Test this conjecture.

$$\begin{aligned} h(-x) &= \sqrt{(-x)^2 - 9} \\ &= \sqrt{x^2 - 9} \\ &= h(x) \end{aligned}$$

The function is even because $h(-x) = h(x)$. Therefore, the graph of the function is symmetric with respect to the y-axis.



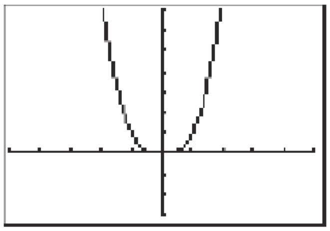
[−5, 5] scl: 1 by [−5, 5] scl: 1

Even; the graph of $h(x)$ is symmetric with respect to the y-axis.

$$\begin{aligned} h(-x) &= \sqrt{(-x)^2 - 9} \\ &= \sqrt{x^2 - 9} \\ &= h(x) \end{aligned}$$

Name: Jeff Denney School: Spain Park High School Grade: 12 Class: PreCalculus

39. $f(x) = |x^3|$

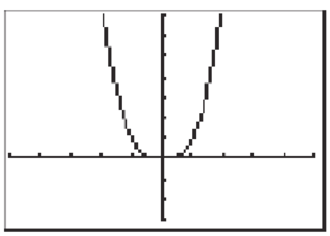


[−5, 5] scl: 1 by [−3, 7] scl: 1

It appears that the graph of the function is symmetric with respect to the y-axis. Test this conjecture.

$$\begin{aligned} f(-x) &= \left|(-x)^3\right| \\ &= \left|-x^3\right| \\ &= \left|x^3\right| \\ &= f(x) \end{aligned}$$

The function is even because $f(-x) = f(x)$. Therefore, the graph of the function is symmetric with respect to the y-axis.



[−5, 5] scl: 1 by [−3, 7] scl: 1

Even; the graph of $h(x)$ is symmetric with respect to the y-axis.

$$\begin{aligned} f(-x) &= |(-x)^3| \\ &= |-x^3| \\ &= f(x) \end{aligned}$$