4.4 Exercises

Exercise 4.1

Graph the function in Desmos.

a) $y = 3x - 5$ b) $y = x^2 - 3x - 2$ c) $y = x^4 - 3x^3 + 2x - 1$
d) $y = \sqrt{x^2 - 4}$ e) $y = \frac{4x+3}{2x+5}$ f) $y = |x + 3|$

Exercise 4.2

For each of the functions below, use Desmos to find all roots, all local maxima, all local minima, and the y-intercept.

a) $f(x) = x^3 + 4x^2 - 2x - 9$
b) $f(x) = x^3 - 6x^2 + 7x + 4$
c) $f(x) = -4x^3 + 3x^2 + 7x + 1$
d) $f(x) = 5x^3 + 2x^2$
e) $f(x) = x^4 - x^3 - 4x^2 + 1$
f) $f(x) = -x^4 + 5x^3 - 4x + 3$
g) $f(x) = x^5 + 2x^4 - x^3 - 3x^2 - x$
h) $f(x) = \sqrt{|2^x - 3|} - 2x + 3$

Exercise 4.3

Determine the domain and range using Desmos.

a) $y = |x - 2| + 5$ b) $y = -2x + 7$
c) $y = x^2 - 6x + 4$ d) $y = -x^2 - 8x + 3$
e) $y = 3 + \sqrt{x + 5}$ f) $y = 6 - x + \sqrt{4 - x}$
g) $y = x^4 - 8x^2 + 9$ h) $y = \frac{x-2}{x-3}$

Exercise 4.4

Use Desmos to determine whether the equation describes a function or not.

a) $x^2 + 2y - 3x = 7$ b) $x^2 + 2y^2 - 3x = 7$
c) $y^2 + 8y + 15 = x$ d) $y^3 + x^2 + y + x = 1$
e) $y = \frac{2x-5}{x-3}$ f) $x^2 + \left(y - \sqrt{|x|}\right)^2 = 1$

Exercise 4.5

Solve the equation for y and graph all branches in Desmos in the same window.

a) $x^2 + y^2 = 4$
b) $(x+5)^2 + y^2 = 15$
c) $(x-1)^2 + (y-2)^2 = 9$
d) $y^2 = x^2 + 3$

Exercise 4.6

Set up the general equation of a circle in Desmos, where the center and the radius can be changed using sliders. If a circle of radius 3 with center at the origin $(0, 0)$ is shifted 4 units to the right and shifted 2 units down, then what is its equation?

Exercise 4.7

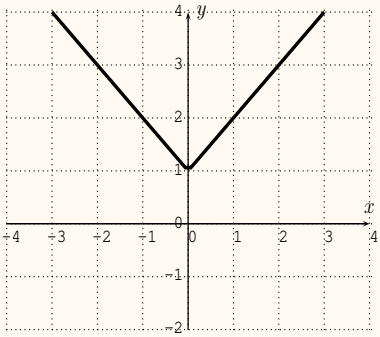
Use Desmos to find all solutions of the equation. Round your answer to the nearest thousandth.

a) $x^3 + 3 = x^5 + 7$
b) $4x^3 + 6x^2 - 3x - 2 = 0$
c) $\frac{2x}{x-3} = \frac{x^2+2}{x+1}$
d) $5^{3x+1} = x^5 + 6$
e) $x^3 + x^2 = x^4 - x^2 + x$
f) $3x^2 = x^3 - x^2 + 3x$

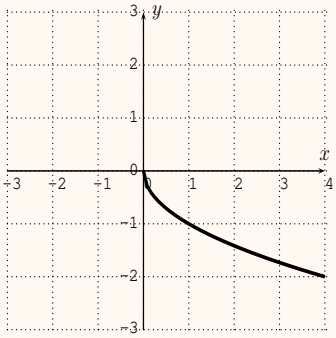
Exercise 4.8

Find a possible formula of the graph displayed below.

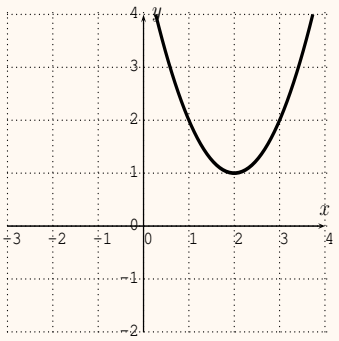
a)



b)



c)



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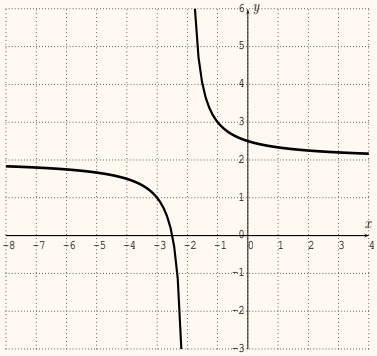

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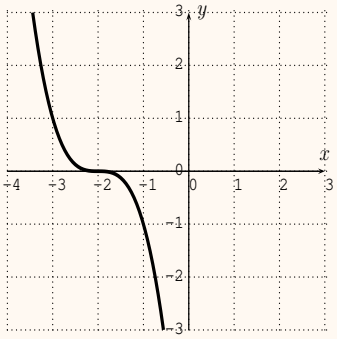
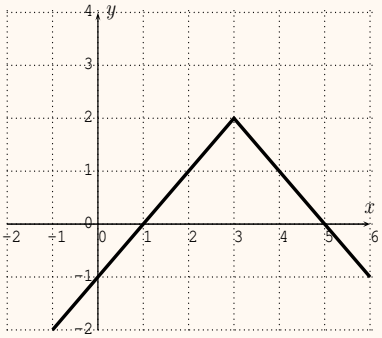


f)



Exercise 4.9

Sketch the graph of the function based on the basic graphs and their transformation described in Section 4.3. Confirm your answer by graphing the function with the graphing calculator.

a) $f(x) = |x| - 3$
b) $f(x) = \frac{1}{x+2}$
c) $f(x) = -x^2$
d) $f(x) = (x-1)^3$
e) $f(x) = \sqrt{-x}$
f) $f(x) = 4 \cdot |x-3|$
g) $f(x) = -\sqrt{x} + 1$
h) $f(x) = (\frac{1}{2} \cdot x)^2 + 3$

Exercise 4.10

Consider the graph of $f(x) = x^2 - 7x + 1$. Find the formula of the function that is given by performing the following transformations on the graph.

a) Shift the graph of f down by 4.
b) Shift the graph of f to the left by 3 units.
c) Reflect the graph of f about the x-axis.
d) Reflect the graph of f about the y-axis.
e) Stretch the graph of f away from the y-axis by a factor 3.
f) Compress the graph of f toward the y-axis by a factor 2.

Exercise 4.11

How are the graphs of f and g related?

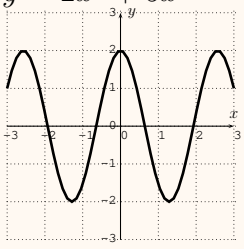
a)	$f(x) = \sqrt{x}$,	$g(x) = \sqrt{x-5}$
b)	$f(x) = \lvert x \rvert$,	$g(x) = 2 \cdot \lvert x \rvert$
c)	$f(x) = (x+1)^3$,	$g(x) = (x-3)^3$
d)	$f(x) = x^2 + 3x + 5$,	$g(x) = (2x)^2 + 3(2x)^2 + 5$
e)	$f(x) = \frac{1}{x+3}$,	$g(x) = -\frac{1}{x}$
f)	$f(x) = 2 \cdot \lvert x \rvert$,	$g(x) = \lvert x+1 \rvert + 1$

Exercise 4.12

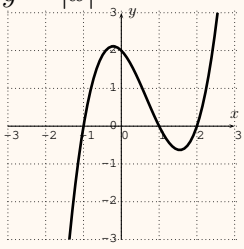
Determine if the function is even, odd, or neither.

a) $y = 2x^3$
b) $y = 5x^2$
c) $y = 3x^4 - 4x^2 + 5$
d) $y = 2x^3 + 5x^2$
e) $y = |x|$
f) $y = \frac{1}{x}$

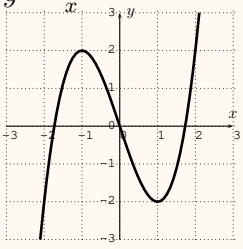
g)



h)

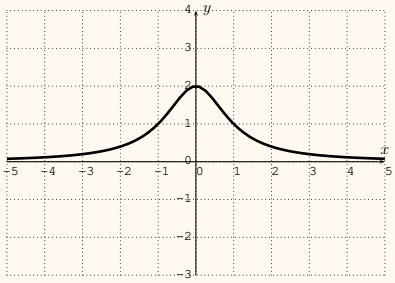


i)



Exercise 4.13

The graph of the function $y = f(x)$ is displayed below.



Sketch the graph of the following functions.

a) $y = f(x) + 1$ b) $y = f(x - 3)$ c) $y = -f(x)$
d) $y = 2f(x)$ e) $y = f(2x)$ f) $y = f(\frac{1}{2}x)$