1 If the point (2, 7) is on the graph of an equation in x and y, then the equation is satisfied when we replace x by 2 and y by 7.

Is the point (2, 7) on the graph of the equation $2y = x + 3$?

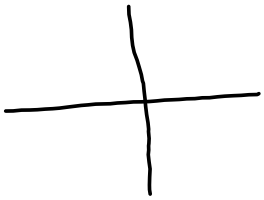
$2(7) = 2 + 3$?
$14 = 5$? No!

Complete the table.

x	y	(x, y)
−2	$\frac{1}{2}$	$(2, \frac{1}{2})$
−1	1	$(-1, 1)$
0	$\frac{3}{2}$	$(0, \frac{3}{2})$
1	2	$(1, 2)$
2	$\frac{5}{2}$	$(2, \frac{5}{2})$

$2y = x + 3$
$2y = -2 + 3 = 1 \Rightarrow y = \frac{1}{2}$
$2y = -1 + 3 = 2 \Rightarrow y = \frac{2}{2} = 1$
$2y = 0 + 3 = 3 \Rightarrow y = \frac{3}{2}$
$2y = 1 + 3 = 4 \Rightarrow y = 2$
$2y = 2 + 3 = 5 \Rightarrow y = \frac{5}{2}$

Sketch the graph.



2

(a) To find the x-intercept(s) of the graph of an equation, we set ---Select--- equal to 0 and solve for ---Select---. So the x-intercept of $5y = x + 1$ is ____.

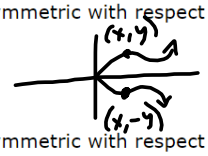
y x

(b) To find the y-intercept(s) of the graph of an equation, we set ---Select--- equal to 0 and solve for ---Select---. So the y-intercept of $5y = x + 1$ is ____.

x y

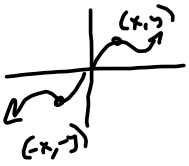
3

(a) If a graph is symmetric with respect to the x-axis and (a, b) is on the graph, then (____) is also on the graph.



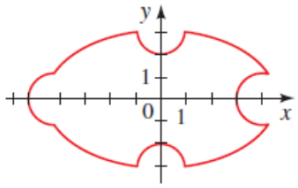
(b) If a graph is symmetric with respect to the y-axis and (a, b) is on the graph, then (____) is also on the graph.

(c) If a graph is symmetric about the origin and (a, b) is on the graph, then (____) is also on the graph.



4

The graph of an equation is shown below.



(a) The x-intercepts are (x, y) = (____) (smaller x-value) and (x, y) = (____) (larger x-value) and the y-intercepts are (x, y) = (____) (smaller y-value) and (x, y) = (____) (larger y-value).

(b) The graph is symmetric about the ---Select---.

Determine whether the given points are on the graph of the equation.

5 $y = \sqrt{1 - x}$; (2, 1), (−3, 2), (0, 1)

(2, 1)
- Yes
- No

(−3, 2)
- Yes
- No

(0, 1)
- Yes
- No

$(2,1)$? $1 = \sqrt{1-2} = \sqrt{-1} = i \notin \mathbb{R}$ = set of real numbers.

$a \in B$ means "a" is in the collection "B"

$(-3,2)$? $2 = \sqrt{1-(-3)} = \sqrt{1+3} = \sqrt{4} = 2$

"a" is an element of "B"

$1 = \sqrt{1-0} = \sqrt{1} = 1$

Determine whether the given points are on the graph of the equation. (Select all that apply.)

6 $y(x^2 + 1) = 1$; (1, 1), $\left(3, \frac{1}{10}\right)$, $\left(-3, \frac{1}{10}\right)$

- [ ] The point (1, 1) is on the graph of the equation.
- [ ] The point $\left(3, \frac{1}{10}\right)$ is on the graph of the equation.
- [ ] The point $\left(-3, \frac{1}{10}\right)$ is on the graph of the equation.
- [ ] None of these points are on the graph of the equation.

$(1)(1^2+1) = 1(2) = 2 \stackrel{?}{=} 1$ No

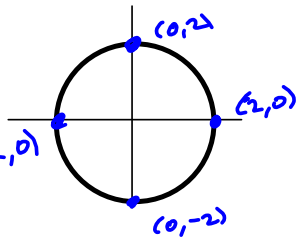
$\left(\frac{1}{10}\right)(3^2+1) = \left(\frac{1}{10}\right)(10) = \left(\frac{1}{10}\right)\left(\frac{10}{1}\right) = 1 \stackrel{?}{=} 1$ likes

$\left(\frac{1}{10}\right)((-3)^2+1) = \frac{1}{10}(3^2+1) = \frac{1}{10}(10) = 1$ ✓

Determine whether the given points are on the graph of the equation. (Select all that apply.)

7 $x^2 + y^2 = 4$; $(0, 2), \left(\frac{2}{\sqrt{2}}, \frac{2}{\sqrt{2}}\right), \left(\frac{\sqrt{15}}{2}, \frac{1}{2}\right)$

Circle $x^2+y^2=r^2$



- [x] The point (0, 2) is on the graph of the equation.
- [x] The point $\left(\frac{2}{\sqrt{2}}, \frac{2}{\sqrt{2}}\right)$ is on the graph of the equation.
- [x] The point $\left(\frac{\sqrt{15}}{2}, \frac{1}{2}\right)$ is on the graph of the equation.
- [ ] None of these points are on the graph of the equation.

$\left(\frac{\sqrt{15}}{2}\right)^2 + \left(\frac{1}{2}\right)^2 = \frac{15}{4} + \frac{1}{4}$

$= \frac{16}{4} = 4$! Sweet!

$\left(\frac{2}{\sqrt{2}}\right)^2 + \left(\frac{2}{\sqrt{2}}\right)^2 \stackrel{?}{=} 4$

$\frac{2^2}{\sqrt{2}^2} + \frac{2^2}{\sqrt{2}^2} =$

$= \frac{4}{2} + \frac{4}{2} = 2+2 = 4$

$(\sqrt{2})^2 = \sqrt{2}\sqrt{2}$

$= \sqrt{2 \cdot 2} = 2$

Product of 2 radicals is the radical of the product of the radicands.

Make a table of values for the equation.

8 $y = -4x$

x	y
−2	8
−1	4
0	0
1	-4
2	

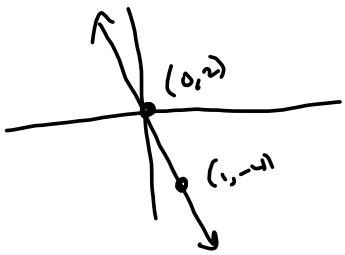
$y = -4(-2) = 8$

$y = -4(-1) = 4$

$y = -4(1) = -4$

$y = -4(2) = -8$

Sketch a graph of the equation.



9 Make a table of values.

$3x + 5y = 30$

x	y
−3	39/5
−2	36/5
−1	33/5
0	6
1	27/5
2	24/5
3	21/5

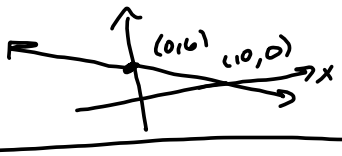
Sketch the graph of the equation.

"General Form" (almost)
Standard Technique: Intercept Method

x	y
0	6
10	0

$5y = 30 \Rightarrow y = \frac{30}{5} = 6$

$3x = 30 \Rightarrow x = 10$



What WebAssign Wants:

$3(-3)+5y=30$
$-9+5y=30$
$+9 \quad =+9$
$5y=39$
$y=\frac{39}{5}$

$3(-2)+5y=30$
$-6+5y=30$
$+6 \quad =+6$
$5y=36$
$y=\frac{36}{5}$

$x=-1$:
$3(-1)+5y=30$
$-3+5y=30$
$+3 \quad =+3$
$5y=33$
$y=\frac{33}{5}$

$x=1$:
$3(1)+5y=30$
$3+5y=30$
$5y=27$
$y=\frac{27}{5}$

$x=2$:
$3(2)+5y=30$
$6+5y=30$
$5y=24$
$y=\frac{24}{5}$

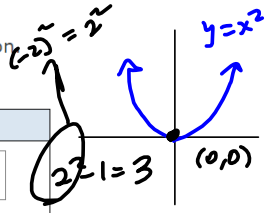
$x=3$:
$3(3)+5y=30$
$9+5y=30$
$5y=21$
$y=\frac{21}{5}$

10 Make a table of values for the equation.

$y = x^2 - 1$

x	y
−2	3
−1	0
0	−1
1	0
2	3

$(-2)^2 = 2^2$



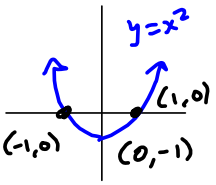
$2^2-1=3$

$(-1)^2-1=0$

$0^2-1=-1$

$1^2-1=0$

$2^2-1=4-1=3$

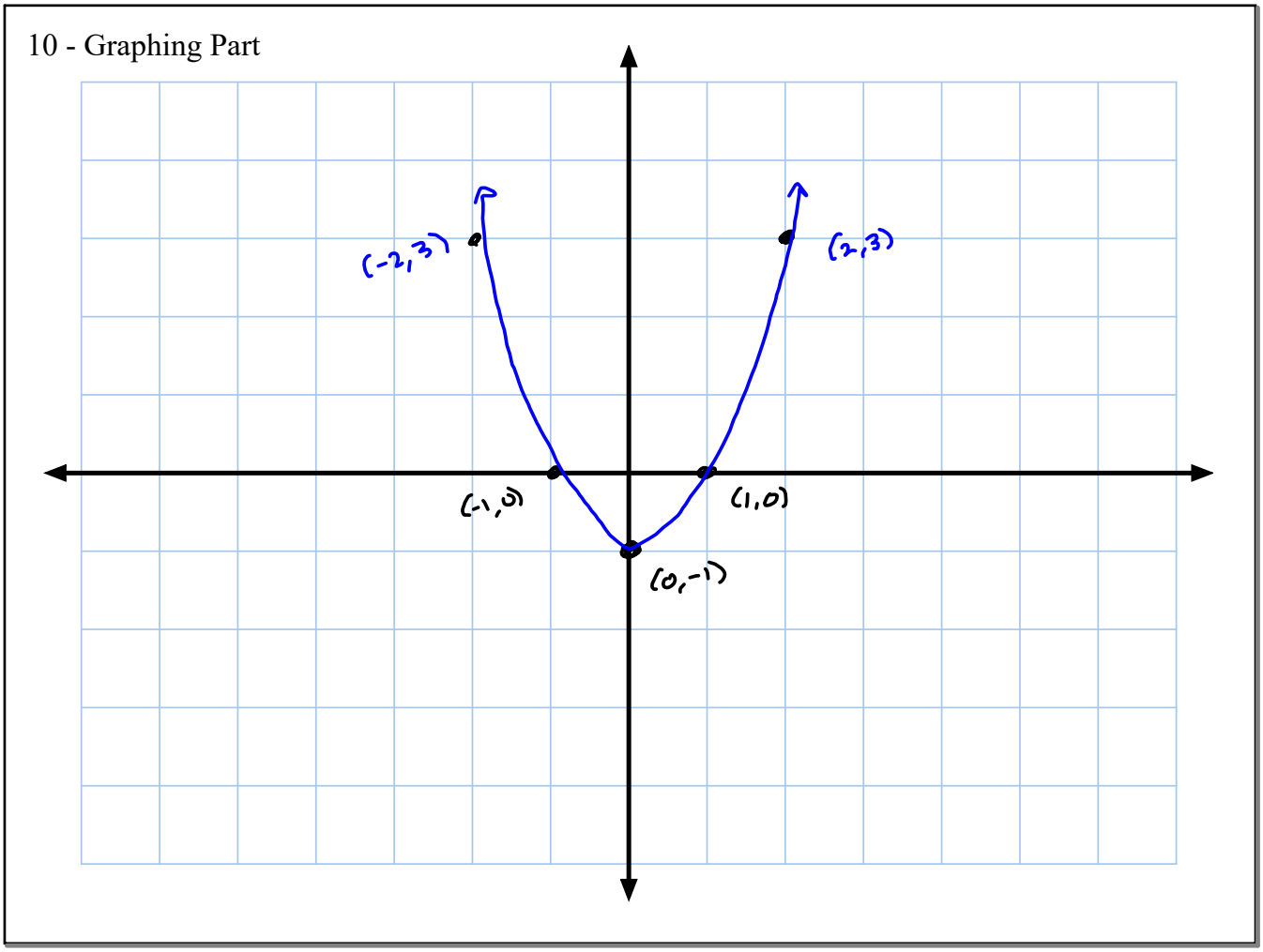


$-2^2=-4$

$(-2)^2=+4$

$x^2-1=0$
$x^2=1$
$\sqrt{x^2}=\sqrt{1}$
$\pm x=1$
$(1,0), (-1,0)$

Sketch a graph of the equation.


10 - Graphing Part
(-2,3)
(2,3)
(-1,0)
(1,0)
(0,-1)

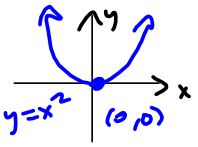
Make a table of values for the equation.

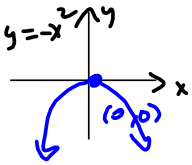
11 $y = 9 - x^2$ $= -x^2 + 9$

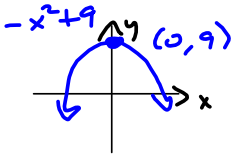
x	y
−2	5
−1	8
0	9
1	8
2	5

Parabola $y = ax^2 + bx + c$

This an x^2 flipped across x-axis & moved up 9.







$-(-2)^2 + 9 = -2^2 + 9 = -4 + 9 = 5$

$-(-1)^2 + 9 = -1^2 + 9 = -1 + 9 = 8$

$-0^2 + 9 = 9$

Sketch a graph of the equation.

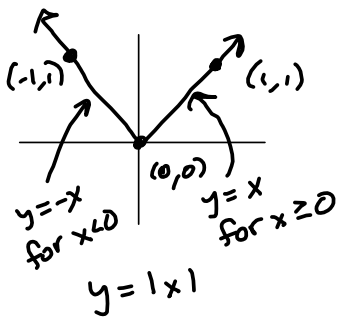
Make a table of values.

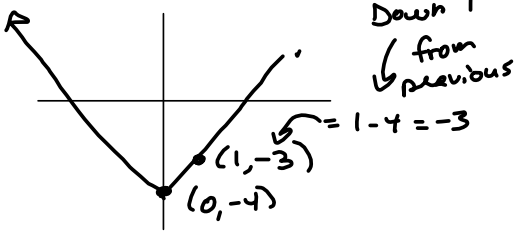
12 $y = |x| - 4$

x	y
−3	−1
−2	−2
−1	−3
0	−4
1	−3
2	−2
3	−1

$|3| = 3$, $|-3| = 3$

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$





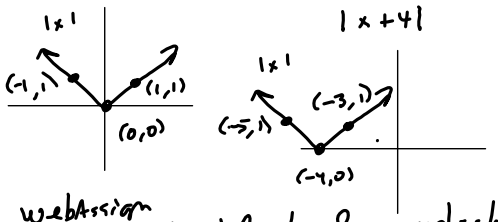
WebAssign wants blind plug & chug.

Sketch the graph of the equation.

13 Make a table of values.

$y = |x + 4|$

x	y
−3	1
−2	2
−1	3
0	4
1	5
2	6
3	7



WebAssign wants blind plug-and-chug

$y = |-3+4| = |1| = 1$
$y = |-2+4| = |2| = 2$
$y = |-1+4| = 3$
$y = |0+4| = 4$
$y = |1+4| = 5$
$y = |2+4| = 6$
$y = |3+4| = 7$

This doesn't capture where the vertex is. Too far right. That's why just plotting points without any idea of the shape sucks.

Sketch the graph of the equation.

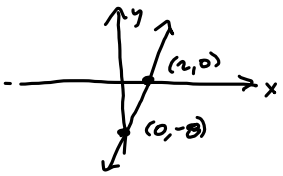
14 Make a table of values, and sketch the graph of the equation. Find the x- and y-intercepts, and test for symmetry.

(a) $4x - y = 8$

Make a table of values, and sketch the graph of the equation.

x	y
0	−8
2	0

$-y = 8$
$4x = 8 \rightarrow x = 2$



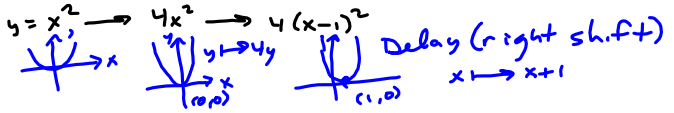
(b) $y = 4(x-1)^2 = 4(x^2-2x+1) = 4x^2-8x+4$

Make a table of values, and sketch the graph of the equation.

x	y
0	4
1	0

$4(-1)^2 = 4$
$4(1-1)^2 = 0$

NOTE: The Parabola Graphing Tool on WebAssign only needs 2 points! I'm sneaking in spoilers on graphing these things in the video, in the meantime.



Find the x- and y-intercepts. (If an answer does not exist, enter DNE.)

x-intercept $(x, y) =$ (1, 0)

y-intercept $(x, y) =$ (0, 4)

$y = 4(0-1)^2 = 4(-1)^2 = 4(1) = 4$

x-int:
$4(x-1)^2 = 0$
$(x-1)^2 = 0$
$\sqrt{(x-1)^2} = \sqrt{0} = 0$
$|x-1| = 0$
$x-1 = \pm 0 = 0$
$x = 1 \rightsquigarrow (1,0)$

$A^2 = B \Rightarrow$
$\sqrt{A^2} = \sqrt{B} \Rightarrow$
$|A| = \sqrt{B}$
$A = \pm\sqrt{B}$

$|3| = 3$
$|-3| = 3$

$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$

$|A| = B \Rightarrow$
$A = \pm B$
(& $B \geq 0$ was necessary to start.)

Test for symmetry. (Select all that apply.)

- ☐ The graph is symmetric with respect to the x-axis.
- ☐ The graph is symmetric with respect to the y-axis.
- ☐ The graph is symmetric with respect to the origin.
- ☐ The graph is not symmetric with respect to the x-axis, the y-axis, or the origin.

Make a table of values, and sketch the graph of the equation. Find the x- and y-intercepts, and test for symmetry.

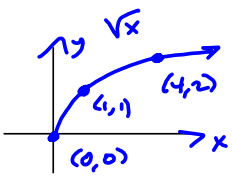
15 (a) $y = \sqrt{x} + 4$

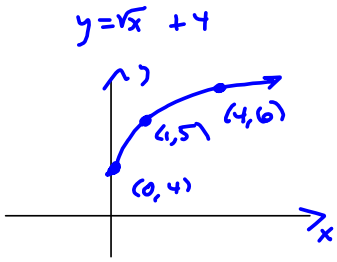
Make a table of values, and sketch the graph of the equation.

Find the x- and y-intercepts. (If an answer does not exist, enter DNE.)

x-intercept $(x, y) =$ ( )

y-intercept $(x, y) =$ (0, 4)





Test for symmetry. (Select all that apply.)

- ☐ The graph is symmetric with respect to the x-axis.
- ☐ The graph is symmetric with respect to the y-axis.
- ☐ The graph is symmetric with respect to the origin.
- ☐ The graph is not symmetric with respect to the x-axis, the y-axis, or the origin.

(b) $y = -|x|$

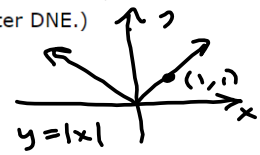
Make a table of values, and sketch the graph of the equation.

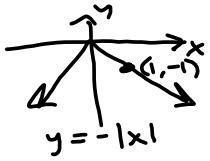
x	y
-1	-1
0	0
1	-1

Find the x- and y-intercepts. (If an answer does not exist, enter DNE.)

x-intercept $(x, y) =$ (0, 0)

y-intercept $(x, y) =$ (0, 0)





Test for symmetry. (Select all that apply.)

- ☐ The graph is symmetric with respect to the x-axis.
- ☐ The graph is symmetric with respect to the y-axis.
- ☐ The graph is symmetric with respect to the origin.
- ☐ The graph is not symmetric with respect to the x-axis, the y-axis, or the origin.

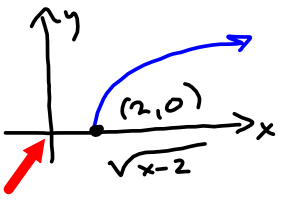
16 Make a table of values, and sketch the graph of the equation. Find the x- and y-intercepts, and test for symmetry.

(a) $y = \sqrt{x - 2}$

Make a table of values, and sketch the graph of the equation.

x	y	
0	~~$\nexists$~~	$\sqrt{0-2} = \sqrt{-2} \notin \mathbb{R}$
2	0	$\sqrt{2-2} = \sqrt{0} = 0$
3	1	$\sqrt{3-2} = \sqrt{1} = 1$
4	$\sqrt{2}$	$\sqrt{4-2} = \sqrt{2}$
6	2	$\sqrt{6-2} = \sqrt{4} = 2$

∃ It exists! THERE EXISTS! There is!



Find the x- and y-intercepts. (If an answer does not exist, enter DNE.)

x-intercept $(x, y) =$ (2,0)

y-intercept $(x, y) =$ (DNE)

Test for symmetry. (Select all that apply.)

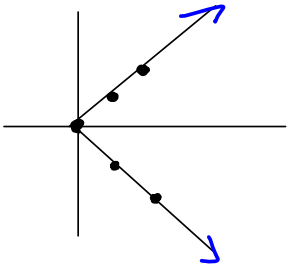
- ☐ The graph is symmetric with respect to the x-axis.
- ☐ The graph is symmetric with respect to the y-axis.
- ☐ The graph is symmetric with respect to the origin.
- ☐ The graph is not symmetric with respect to the x-axis, the y-axis, or the origin.

(b) $x = |y|$ $y = |x|$ & turn on its side

Make a table of values and sketch the graph of the equation.

x	y	
-1	~~$\nexists$~~	DNE $-1 = \|y\|$
0	0	$0 = \|y\| = 0 \Rightarrow y = 0$
1	1	
1	-1	$1 = \|y\| = 1 \Rightarrow y = \pm 1$ ↔ $y=1$, $y=-1$?
2	2	Fill in y-values 1st when x gives more than 1 y!
2	-2	

$x = |-2| = 2 = x$ $x = |2| = 2$



Find the x- and y-intercepts. (If an answer does not exist, enter DNE.)

x-intercept $(x, y) =$ (0,0)

y-intercept $(x, y) =$ (0,0)

Test for symmetry. (Select all that apply.)

- ☐ The graph is symmetric with respect to the x-axis.
- ☐ The graph is symmetric with respect to the y-axis.
- ☐ The graph is symmetric with respect to the origin.
- ☐ The graph is not symmetric with respect to the x-axis, the y-axis, or the origin.

Make a table of values, and sketch the graph of the equation. Find the x- and y-intercepts, and test for symmetry.

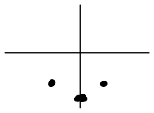
17 (a) $y = -\sqrt{9 - x^2}$ $= -\sqrt{3^2 - x^2}$

x	y
-1	$-\sqrt{8}$
0	-3
1	$-\sqrt{8}$
	0 x-intercept(s)!

$-\sqrt{9-(-1)^2} =$

$-\sqrt{9-1^2} = -\sqrt{9-1} = -\sqrt{8}$

$-\sqrt{9-3^2} = -\sqrt{9} = -3$



Find the x- and y-intercepts. (If an answer does not exist, enter DNE.)

x-intercept $(x, y) =$ ( )

y-intercept $(x, y) =$ ( )

$0 = -\sqrt{9-x^2} = 0$

$(\sqrt{9-x^2})^2 = 0^2$

$9 - x^2 = 0$

$-9 = -9$

$-x^2 = -9$

$x^2 = 9$

$\sqrt{x^2} = \sqrt{9}$

$|x| = 3$

$x = \pm 3$

Test for symmetry. (Select all that apply.)

- ☐ The graph is symmetric with respect to the x-axis.
- ☐ The graph is symmetric with respect to the y-axis.
- ☐ The graph is symmetric with respect to the origin.
- ☐ The graph is not symmetric with respect to the x-axis, the y-axis, or the origin.

Extra: This Thing Is Circular!!!

$y = -\sqrt{9-x^2}$

$x^2 + y^2 = 9$ is a circle of radius 3 centered at the origin. $(5', 3')$

Solve for y:

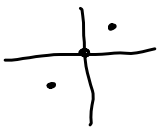
$y^2 = 9 - x^2$

$\sqrt{y^2} = \sqrt{9-x}$

(b) $x = y^3$

Make a table of values, and sketch the graph of the equation.

x	y
-1	-1
0	0
1	1



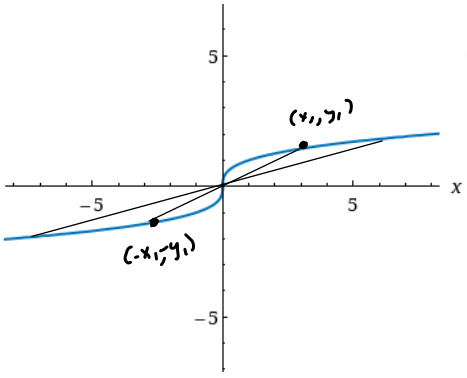
Find the x- and y-intercepts. (If an answer does not exist, enter DNE.)

x-intercept $(x, y) =$ ( )

y-intercept $(x, y) =$ ( )

Test for symmetry. (Select all that apply.)

- ☐ The graph is symmetric with respect to the x-axis.
- ☐ The graph is symmetric with respect to the y-axis.
- ☐ The graph is symmetric with respect to the origin.
- ☐ The graph is not symmetric with respect to the x-axis, the y-axis, or the origin.



Symmetry about (thru) the origin.

Find the x- and y-intercepts of the graph of the equation. (If an answer does not exist, enter DNE.)

18 (a) $y = x + 5$

x-intercept $(x, y) =$ $(-5, 0)$

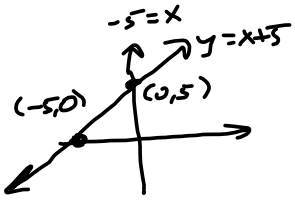
y-intercept $(x, y) =$ $(0, 5)$

x	y
0	5
−5	0

$y = 0 + 5 = 5$

$0 = x + 5$

$-5 = x$

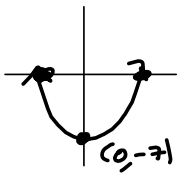


(b) $y = x^2 - 7$

x-intercept (smaller x-value) $(x, y) =$ $(-\sqrt{7}, 0)$

x-intercept (larger x-value) $(x, y) =$ $(\sqrt{7}, 0)$

y-intercept $(x, y) =$ $(0, -7)$



x-int!

$x^2 - 7 = 0$

$x^2 = 7$

$\sqrt{x^2} = \sqrt{7}$

$|x| = \sqrt{7}$

$x = \pm\sqrt{7}$

Test the equation for symmetry. (Select all that apply.)

$y = x^3 + 16x$

19

- ☐ The graph of the equation is symmetric with respect to the x-axis.
- ☐ The graph of the equation is symmetric with respect to the y-axis.
- ☐ The graph of the equation is symmetric with respect to the origin.

Symmetry:

Replace x by $-x$ & get $+y$: y-axis ✗

" " " $-x$ " " $-y$: ORIGIN ✓

" y " $-y$ " " x: x-axis ✗

$y = x^3 + 16x$

$(-x)^3 + 16(-x) = -x^3 - 16x = -(x^3 + 16x) = -y$!

$((-1)(x))^3 - 16x = (-1)^3(x)^3 - 16x = -1x^3 - 16x = -y$

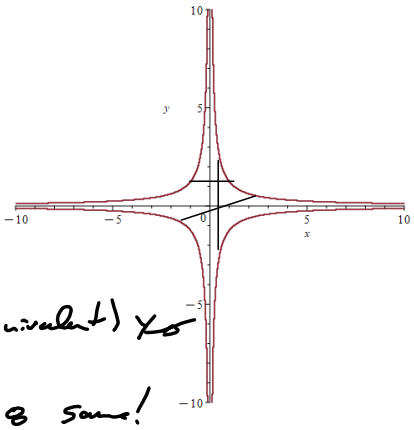
$-y = -(x^3 + 16x) = -x^3 - 16x = (-x)^3 + 16(-x)$ gives $-x$

For x-axis symmetry $-y$ should give the same $+x$

Test the equation for symmetry. (Select all that apply.)

20 $x^8y^8 + x^4y^4 = 8$

- ☐ The graph is symmetric with respect to the x-axis.
- ☐ The graph is symmetric with respect to the y-axis.
- ☐ The graph is symmetric with respect to the origin.



y-axis: $-x$ yields $+y$

$(-x)^8 y^8 + (-x)^4(y^4) = 8$

$x^8y^8 + x^4y^4 = 8$ Same! (Equivalent) Yes

x-axis:

$x^8(-y)^8 + x^4(-y)^4 = x^8y^8 + x^4y^4 = 8$ same!

Yes

$(-x)^8(-y)^8 + (-x)^4(-y)^4 =$

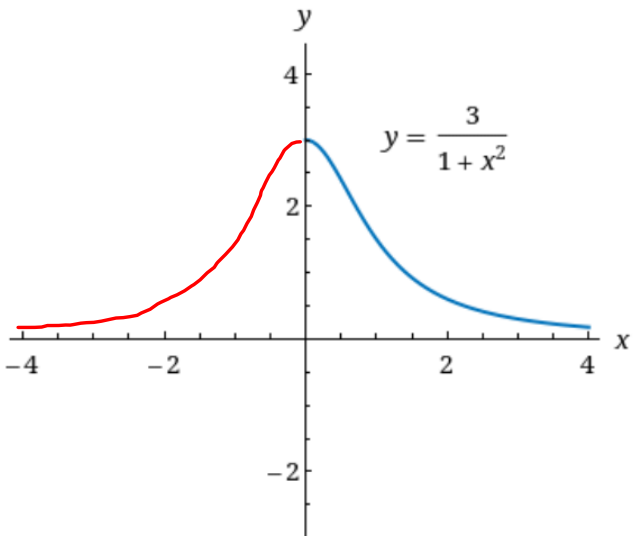
$= x^8y^8 + x^4y^4 = 8$ ✓

Yes

Complete the graph using the given symmetry property.

Symmetric with respect to the y-axis

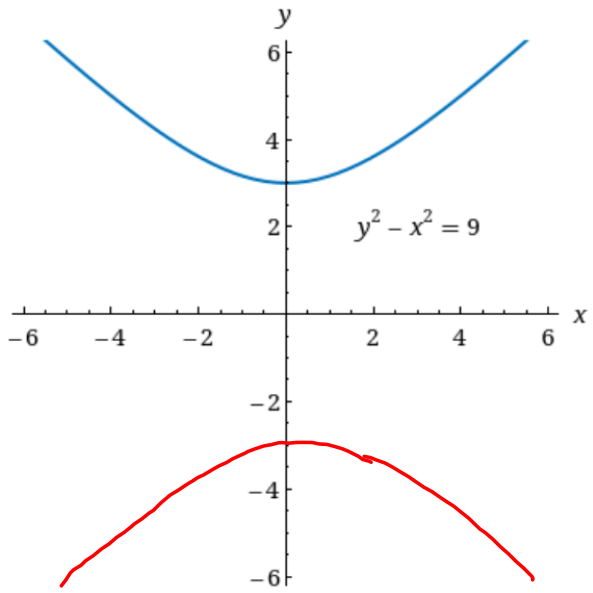
21



Complete the graph using the given symmetry property.

Symmetric with respect to the x-axis

22



Complete the graph using the given symmetry property.

Symmetric with respect to the origin

23

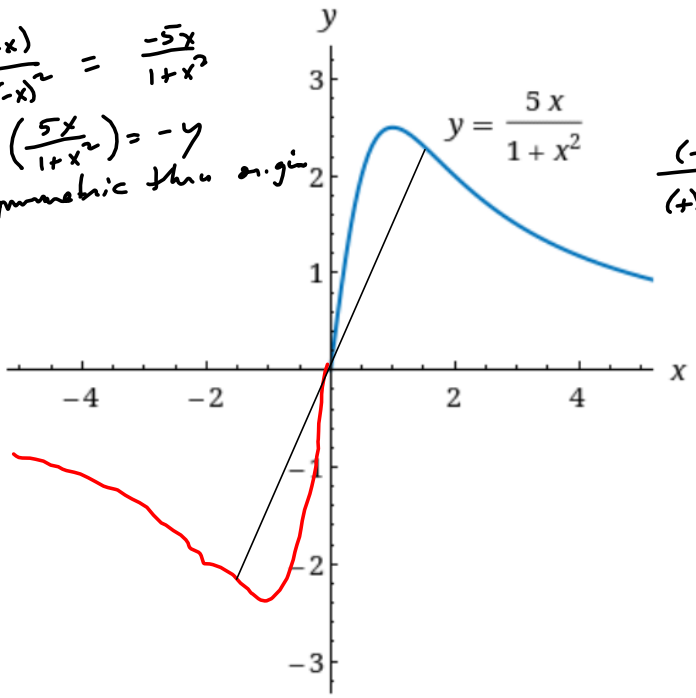
$\frac{5(-x)}{1+(-x)^2} = \frac{-5x}{1+x^2}$

$= -\left(\frac{5x}{1+x^2}\right) = -y$

Symmetric thru origin

$\frac{(-)}{(+)} = \frac{(-)}{\text{quadrants}}$ = −

−x causes −y



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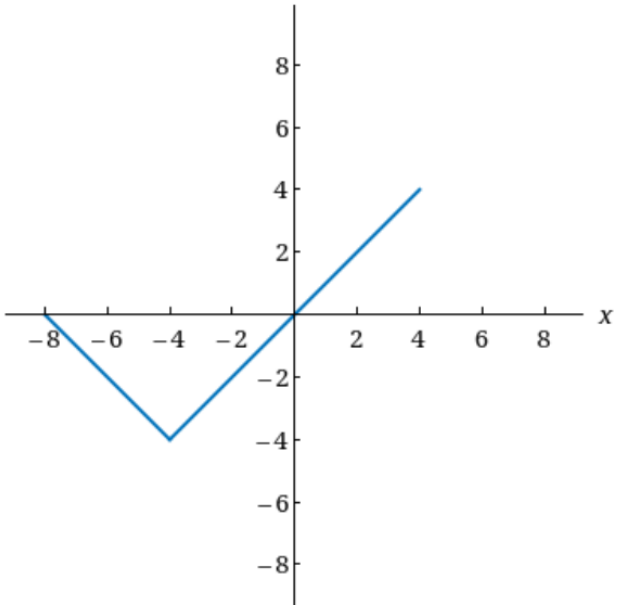


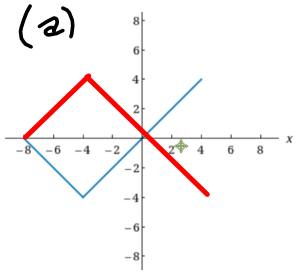
Add line segments to the graph so that it exhibits the indicated symmetry. In each case, add as little as possible.

(a) Symmetry about the *x*-axis

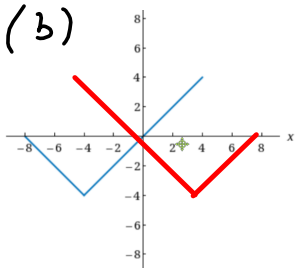
(b) Symmetry about the *y*-axis

(c) Symmetry about the origin

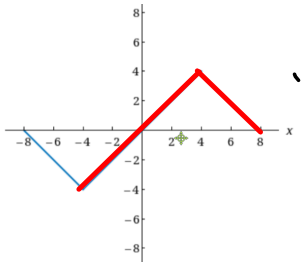
(a)



(b)



(c)



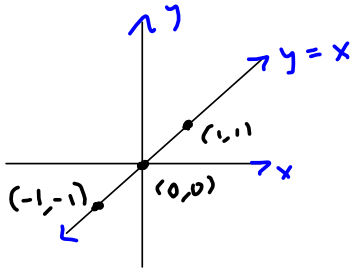
Note:
" $y = x$ " part
didn't go anywhere!
(More on this, later!)
(Inverse Functions

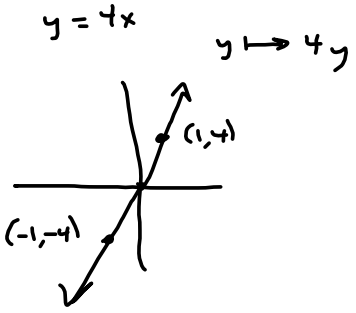
EXTRA! Sneak Preview of Basic Functions for More Insight into some of these exercises and future exercises. In a way, I'm "spoiling the movie" the WebAssign has all laid out, but I just can't help myself.

The Identity Fuction

$y = x$

x	y
-1	-1
0	0
1	1





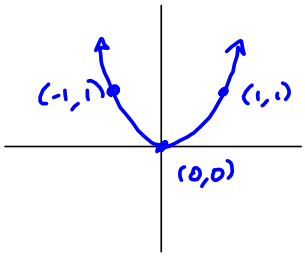
Symmetric through (or "about") the origin.

This means if (x,y) is on the graph, so is (-x,-y)

Square Function

$y = x^2$

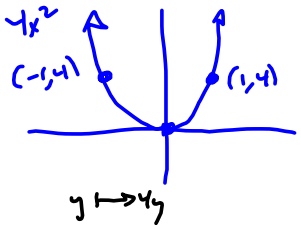
x	y
-1	1
0	0
1	1



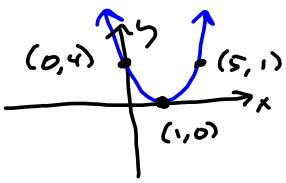
This is symmetric about the y-axis

$4(x-1)^2$ later on:
you want to think of it as

$x^2 \longrightarrow 4x^2$
$y \mapsto 4y$



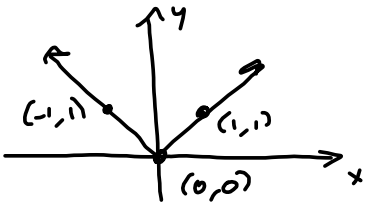
$4(x-1)^2$ RIGHT 1
$x \longmapsto x+1$



Absolute Value Function

$y = |x|$

x	y
-1	1
0	0
1	1



Symmetric about y-axis.

It's like 2 lines

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

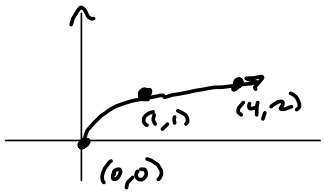
$|3| = 3$

$|-3| = 3$

Square Root Function

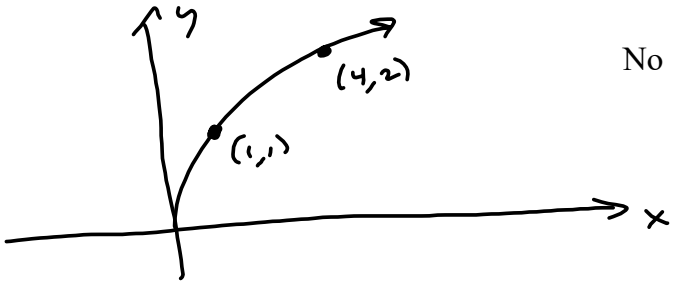
$y = \sqrt{x}$

x	y
0	0
1	1
4	2



ugly

Note $x \geq 0$ is needed to keep $\sqrt{x}$ real.



No Symmetry