Algebra RH

Essential Question: How do we graph absolute value and square root functions?

Do Now: Solve for *x* in each equation

1. $|2x+1|=9$

$2x+1=9$ $\quad$ $2x+1=-9$

$2x=8$ $\quad$ $2x=-10$

$x=4$ or $x=-5$

2. $3|x-4|+2=8$

$3|x-4|=6$

$|x-4|=2$

$x-4=2$ $\quad$ $x-4=-2$

$x=6$ or $x=2$

3. $|4x-7|=x+2$

$4x-7=x+2$ $\quad$ $4x-7=-x-2$

$3x=9$ $\quad$ $5x=5$

$x=3$ or $x=1$

4. $-2|x|=12$

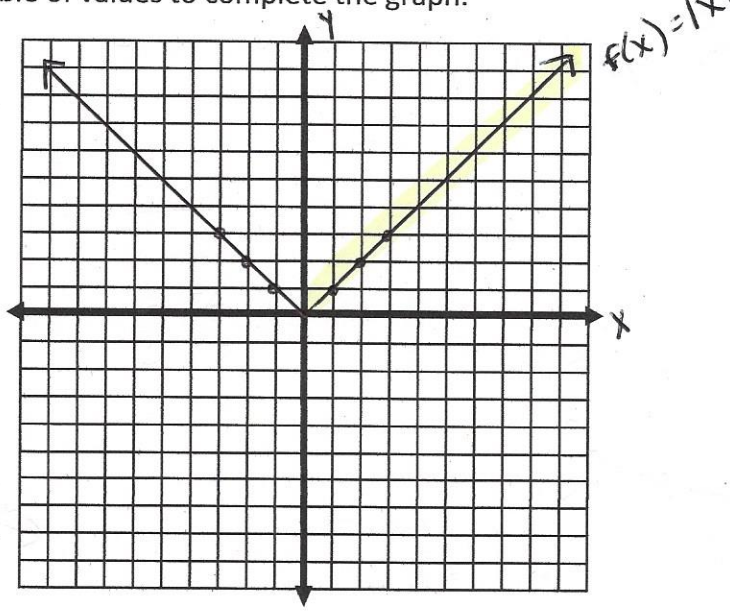
$|x|=-6$

no solution

the absolute value of a number is always positive

Complete the table of values for the parent function, $f(x)=|x|$. ($|x|$ is found under the MATH Key: MATH → NUM → 1:abs) Use the table of values to complete the graph.

x	f(x) = |x|
-3	3
-2	2
-1	1
0	0
1	1
2	2
3	3



y value of the vertex

What is the minimum value of the function? 0

State the domain: $(-\infty, \infty)$ State the range: $[0, \infty)$

State the domain over which the function is increasing: $x>0$ $\quad$ $(0,\infty)$

x values $\quad$ inequality notation $\quad$ interval notation

We call this the <u>PARENT FUNCTION</u>

the simplest function that still satisfies the definition of a certain type of function

ABSOLUTE VALUE FUNCTIONS: One of the most recognized piecewise defined functions

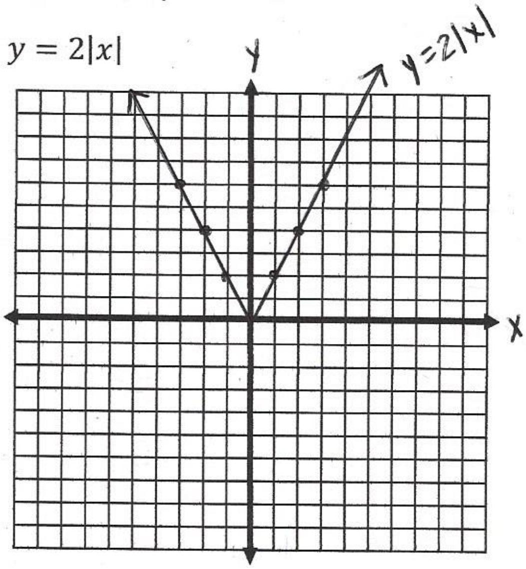
When finding the **range** of an absolute value function, find the vertex (the turning point).

- If the graph opens **upwards**, the range will be **greater than or equal** to the <u>y-coordinate of the vertex.</u>
- If the graph opens **downward**, the range will be **less than or equal** to the <u>y-coordinate of the vertex.</u>

The **average rate of change** is **constant** on each straight line section (ray) of the graph.

Examples: Graph each absolute value function below. State the domain and range for each function.

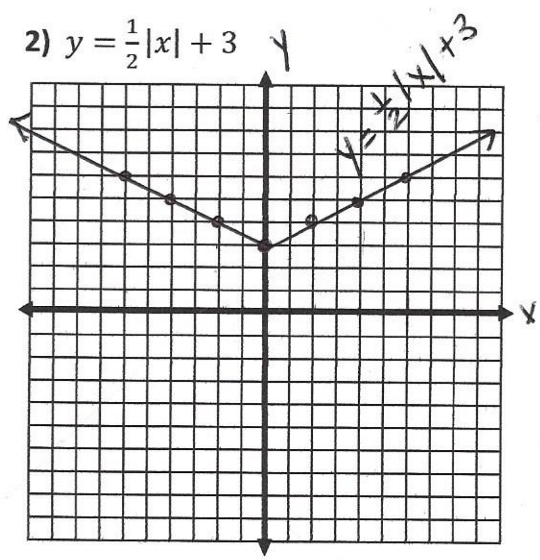
1) $y = 2|x|$



X	Y
-3	6
-2	4
-1	2
0	0
1	2
2	4
3	6

Domain: $(-\infty,\infty)$ Range $[0,\infty)$

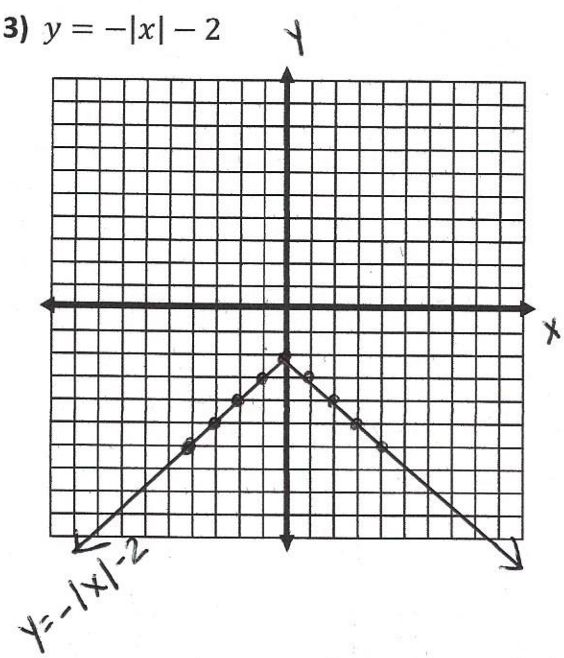
2) $y = \frac{1}{2}|x| + 3$



X	Y
-6	6
-4	5
-2	4
0	3
2	4
4	5
6	6

Domain: $(-\infty,\infty)$ Range $[3,\infty)$

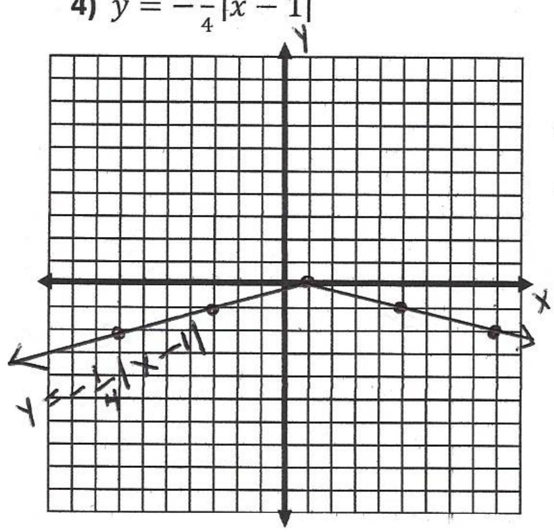
3) $y = -|x| - 2$



X	Y
-4	-6
-3	-5
-2	-4
-1	-3
0	-2
1	-3
2	-4
3	-5
4	-6

Domain: $(-\infty,\infty)$ Range: $(-\infty,-2]$

4) $y = -\frac{1}{4}|x - 1|$



X	Y
-7	-2
-3	-1
1	0
5	-1
9	-2

Domain: $(-\infty,\infty)$

Range: $(-\infty,0]$

A **radical equation** is an equation in which the variable is under the radical symbol (in the radicand).

$\sqrt{x}+3=10$ is a radical equation

$x+\sqrt{3}=10$ is **NOT** a radical equation

To solve radical equations:

1. Isolate the radical to one side of the equal sign.
2. If the radical is a square root, square each side of the equation.
3. Solve the resulting equation.

Examples:

1. $\sqrt{x}=5$

$(\sqrt{x})^2=(5)^2$

$x=25$

2. $\sqrt{\frac{x}{2}}=2$

$\left(\sqrt{\frac{x}{2}}\right)^2=(2)^2$

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

$x=8$

3. $\sqrt{2x+4}-5=0$

$\sqrt{2x+4}=5$

$(\sqrt{2x+4})^2=(5)^2$

$2x+4=25$

$2x=21$

$x=10.5$

4. $\sqrt{3x-4}^{\,2}=\sqrt{2x-6}^{\,2}$

$3x-4=2x-6$

$x-4=-6$

$x=-2$

GRAPHING SQUARE ROOT FUNCTIONS – AKA: RADICAL FUNCTIONS

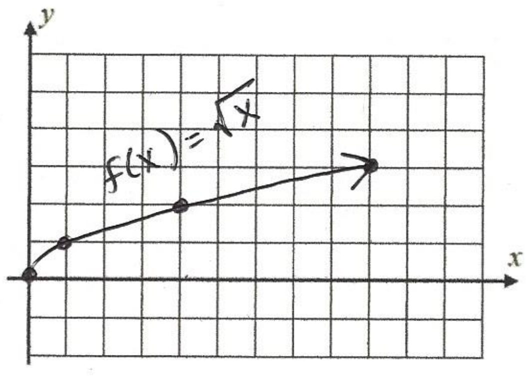
Graph $f(x)=\sqrt{x}$.

to result in an integral output, the radicand must be a perfect square

(a) Create a table of values for input values of x for which you can find rational square roots.

x	0	1	4	9
$f(x)=\sqrt{x}$	0	1	2	3

(b) Graph the function on the grid provided.



(c) What is the domain of this function?

$x\geq 0$ $[0,\infty)$

(d) What is the range of this function?

$y\geq 0$ $[0,\infty)$

(e) Circle the correct choice below that characterizes $f(x)=\sqrt{x}$.

$f(x)$ is always decreasing

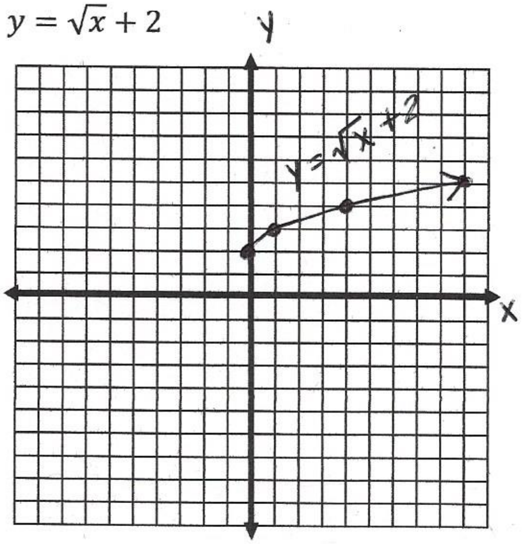
$f(x)$ is always increasing

We call this the PARENT FUNCTION

Examples: Graph each square root function below. State the domain and range for each function.

For the table of values, choose inputs that create a perfect square under the radical.

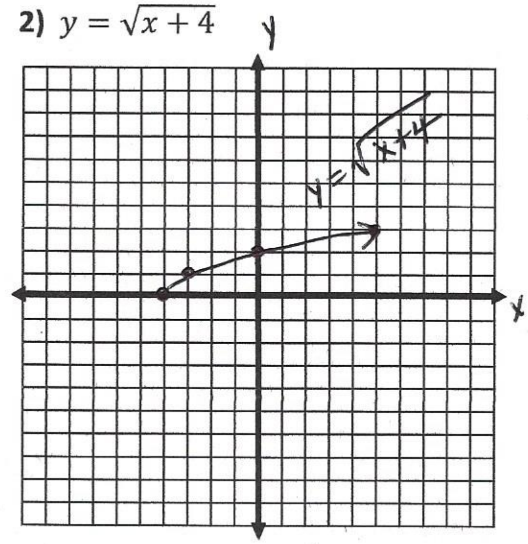
1) $y = \sqrt{x} + 2$



x	y
0	2
1	3
4	4
9	5

Domain: $[0, \infty)$ Range: $[2, \infty)$

2) $y = \sqrt{x + 4}$

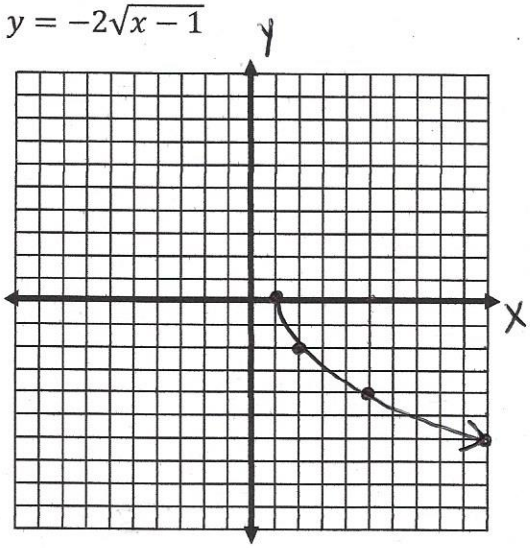


x	y
-4	0
-3	1
0	2
5	3

Domain: $[-4, \infty)$

Range: $[0, \infty)$

3) $y = -2\sqrt{x - 1}$

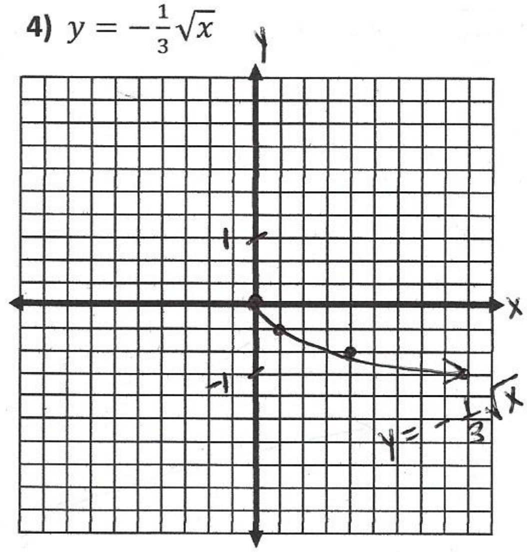


x	y
1	0
2	-2
5	-4
10	-6

Domain: $[1, \infty)$

Range: $(-\infty, 0]$

4) $y = -\frac{1}{3}\sqrt{x}$



x	y
0	0
1	$-\frac{1}{3}$
4	$-\frac{2}{3}$
9	-1

Domain: $[0, \infty)$

Range: $(-\infty, 0]$