

## 6.3 Square Root Functions & Inequalities

objectives: graph & analyze square root functions  
graph square root inequalities

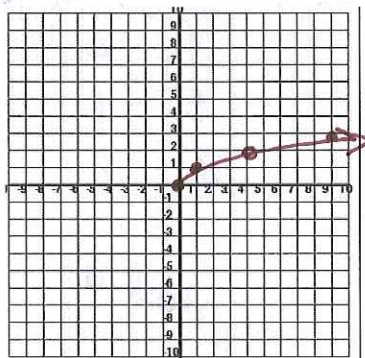
Key

Parent Function:  $f(x) = \sqrt{x}$

Domain:  $[0, \infty)$

Range:  $[0, \infty)$

Minimum:  $(0, 0)$

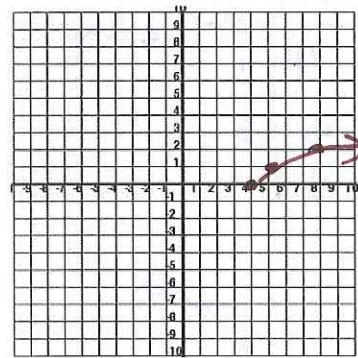


$f(x) = \sqrt{x-4}$

Domain:  $[4, \infty)$

Range:  $[0, \infty)$

min:  $(4, 0)$



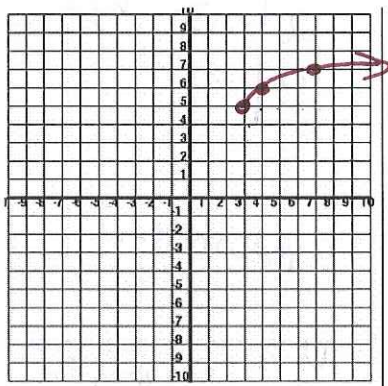
### Transformations of square root functions. $f(x) = a\sqrt{x-h} + k$

Identify the transformations. Graph. State the domain and range of each function.

1.  $f(x) = \sqrt{x-3} + 5$

3 Rt & 5 ↑

x	y
3	5
4	6
7	7



D:  $[3, \infty)$

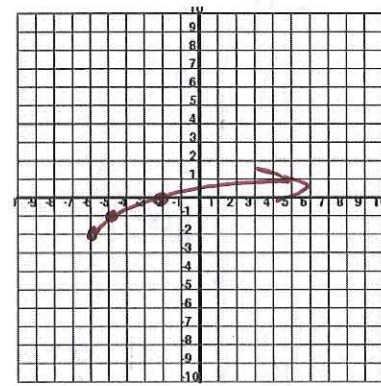
R:  $[5, \infty)$

Minimum:  $(3, 5)$

2.  $f(x) = \sqrt{x+6} - 2$

6 Left & 2 ↓

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



D:  $[-6, \infty)$

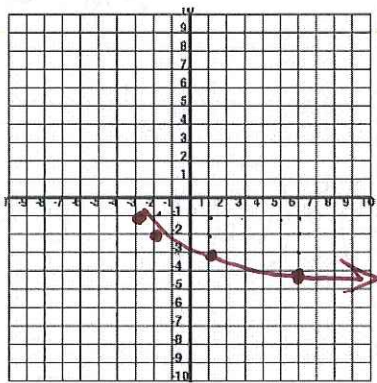
R:  $[-2, \infty)$

minimum:  $(-6, -2)$

3.  $f(x) = -\sqrt{x+3} - 1$

3 Left & 1 ↓  
vert. reflection

x	y
-3	-1
-2	-2
1	-3



D:  $[-3, \infty)$

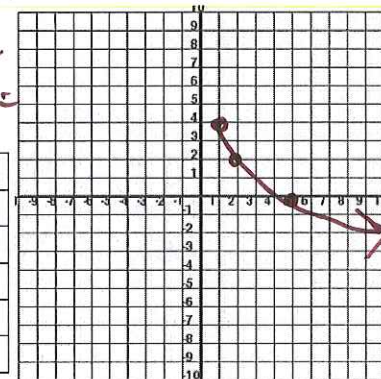
R:  $(-\infty, -1)$

Maximum:  $(-3, -1)$

4.  $f(x) = -2\sqrt{x-1} + 4$

1 Rt & 4 ↑  
vert stretch by 2  
vert. reflection

x	y
1	4
2	2
5	0



D:  $[1, \infty)$

R:  $(-\infty, 4]$

maximum:  $(1, 4)$



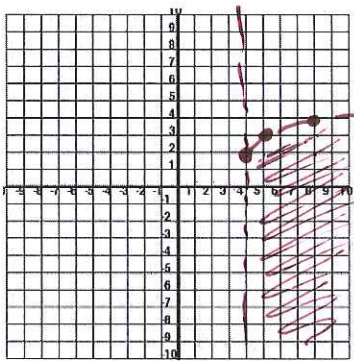
## Square Root Inequalities

dashed line

Ex.  $y < \sqrt{x-4} + 2$

x	y
4	2
5	3
8	4

4Rt & 2up

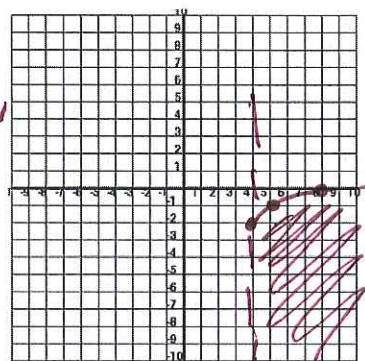


solid line

5.  $y \leq \sqrt{x-4} - 2$

x	y
4	-2
5	-1
8	0

4Rt & 2down

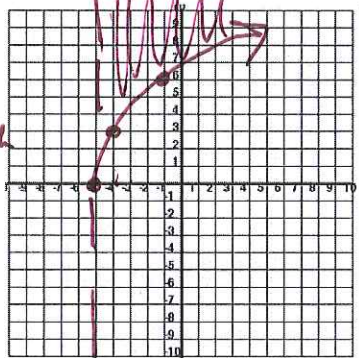


solid

Ex.  $y \geq 3\sqrt{x+5}$

x	y
-5	0
-4	3
-1	6

5 left v. stretch by 3

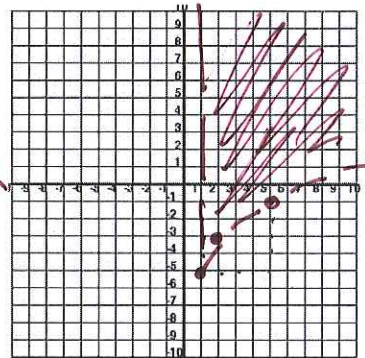


dashed

6.  $y > 2\sqrt{x-1} - 5$

x	y
1	-5
2	-3
5	-1

1Rt 5 down vert. stretch by 2

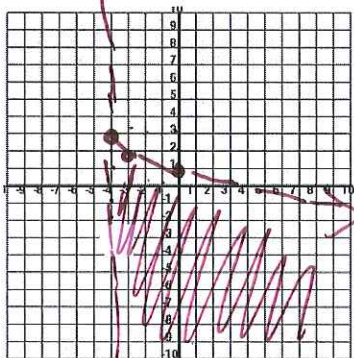


dashed

7.  $y < -\sqrt{x+4} + 3$

x	y
-4	3
-3	2
0	1

4 Left 3 up vert. refl.



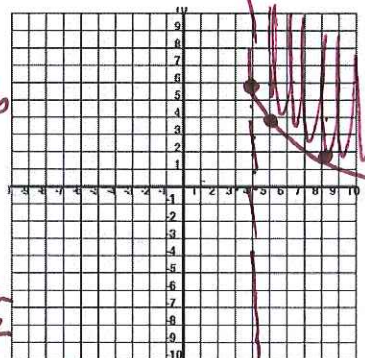
Rewrite!

8.  $y \geq 6 - 2\sqrt{x-4}$

$y \geq -2\sqrt{x-4} + 6$

x	y
4	6
5	4
8	2

4rt. 6 up vert. stretch by 2 vert. reflect



### Applications:

The speed of a tsunami is modeled by the equation  $v = 356\sqrt{d}$  where  $v$  equals speed (velocity) in kilometers and  $d$  = depth of the water. If a tsunami is clocked at 145 km/hour, how deep is the water?

$$\frac{145}{356} = \frac{356\sqrt{d}}{356}$$

$$(.4073)^2 = (\sqrt{d})^2 \quad d = .17 \text{ km deep}$$

Kinetic energy of an object is measured in joules and is modeled by the formula  $E = 0.5mv^2$ . Solve the formula for velocity.

$$E = .05mv^2 \quad \sqrt{v^2} = \sqrt{\frac{E}{.05m}} \quad v = \sqrt{\frac{E}{.05m}}$$