

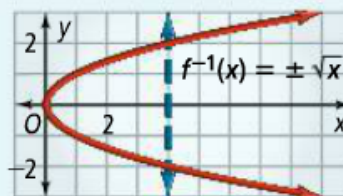
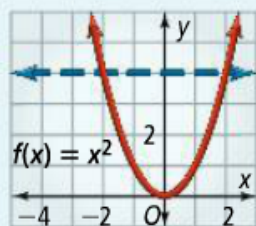
# 6-8

## Graphing Radical Functions

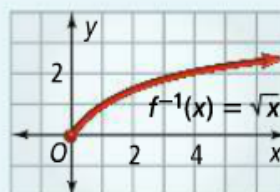
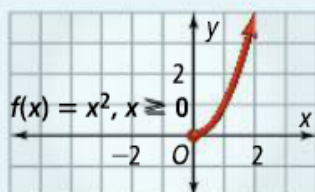
**Objective** To graph square root and other radical functions

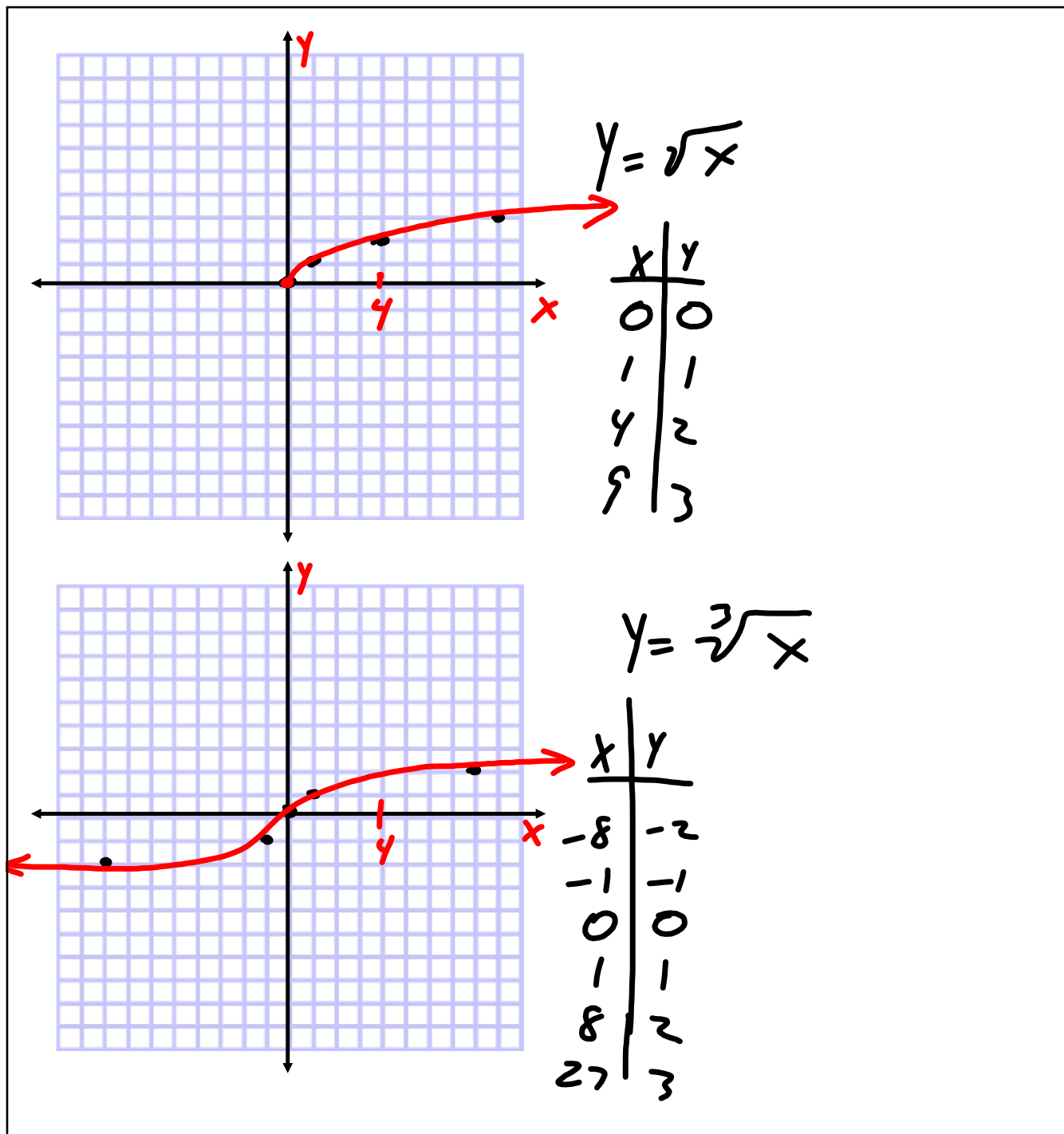
**Essential Understanding** A square root function is the inverse of a quadratic function that has a restricted domain.

A horizontal line can intersect the graph of  $f(x) = x^2$  in two points—where  $f(-2) = f(2)$ , for example. Thus, a vertical line can intersect the graph of  $f^{-1}$  in two points.  $f^{-1}$  is *not* a function because it fails the vertical line test.



However, you can restrict the domain of  $f$  so that the inverse of the restricted function is a function.







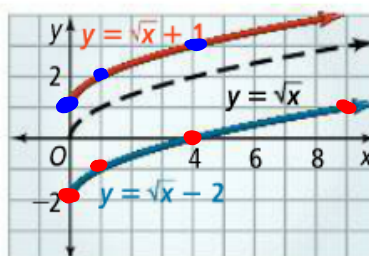
### Problem 1 Translating a Square Root Function Vertically

What are the graphs of  $y = \sqrt{x} - 2$  and  $y = \sqrt{x} + 1$ ?

The graph of  $y = \sqrt{x} - 2$  is the graph of  $y = \sqrt{x}$  shifted down 2 units.

The graph of  $y = \sqrt{x} + 1$  is the graph of  $y = \sqrt{x}$  shifted up 1 unit.

The domains of both functions are the set of nonnegative numbers, but their ranges differ.



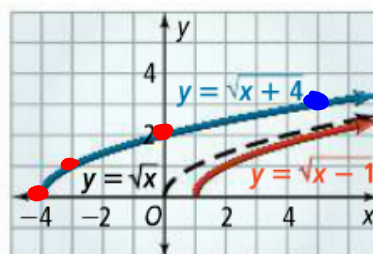
**Problem 2** Translating a Square Root Function Horizontally

What are the graphs of  $y = \sqrt{x + 4}$  and  $y = \sqrt{x - 1}$ ?

The graph of  $y = \sqrt{x + 4}$  is the graph of  $y = \sqrt{x}$  shifted left 4 units.

The graph of  $y = \sqrt{x - 1}$  is the graph of  $y = \sqrt{x}$  shifted right 1 unit.

The ranges of both functions are the set of nonnegative numbers, but their domains differ.





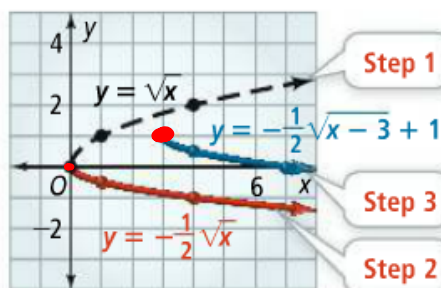
### Problem 3 Graphing a Square Root Function

What is the graph of  $y = -\frac{1}{2}\sqrt{x-3} + 1$ ?

**Step 1** Choose several points from the parent function  $y = \sqrt{x}$ .

**Step 2** Multiply the  $y$ -coordinates by  $a = -\frac{1}{2}$ . This shrinks the parent graph vertically by the factor  $\frac{1}{2}$  and reflects the result in the  $x$ -axis.

**Step 3** The values of  $h$  and  $k$  give the horizontal and vertical translations. Translate the graph from Step 2 to the right 3 units and up 1 unit.

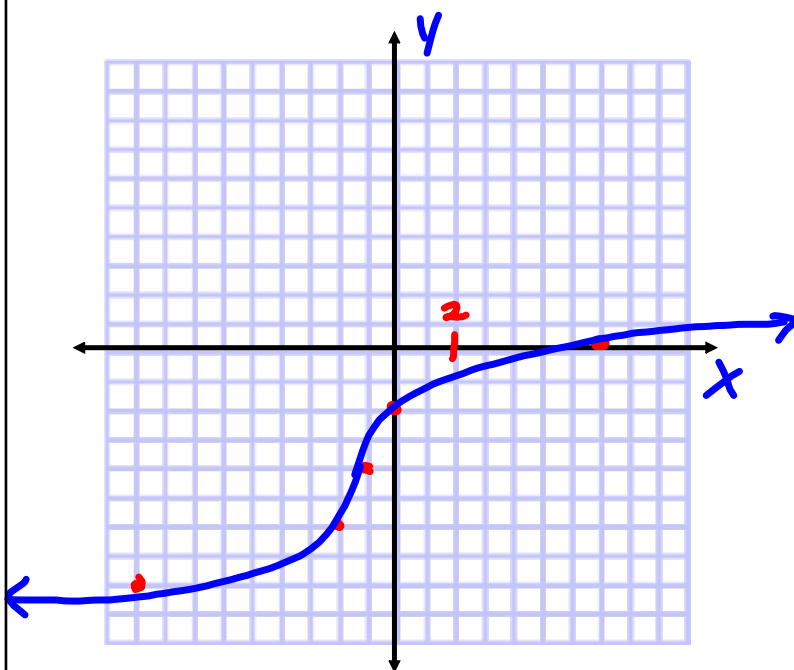


$x$	$y$
3	1
4	0.5
7	0
12	-0.5



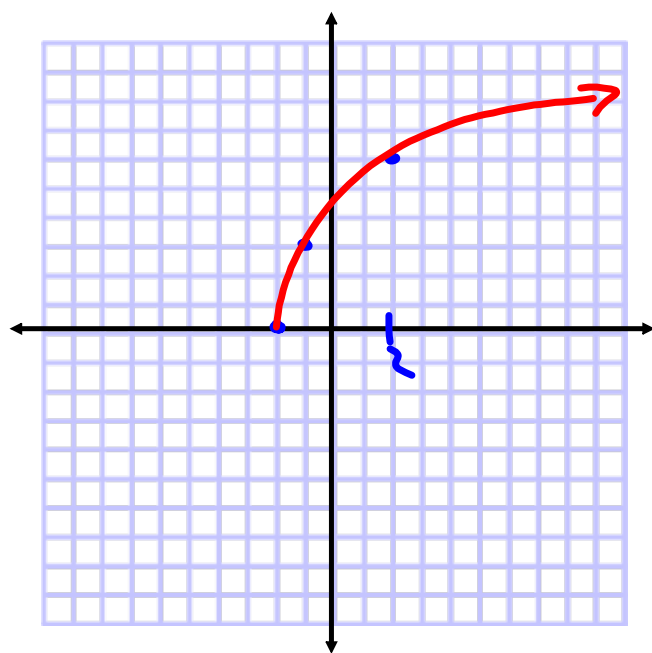
**Problem 5** Graphing a Cube Root Function

What is the graph of  $y = 2\sqrt[3]{x+1} - 4$ ?



**Problem 6** Rewriting a Radical Function

How can you rewrite  $y = \sqrt{9x + 18}$  so you can graph it using transformations?



$$y = \sqrt{9x + 18}$$

$$y = \sqrt{9} \sqrt{x + 2}$$

$$y = 3\sqrt{x + 2}$$