

**Example 4** Write the equation from characteristics

Write the equation for a radical function that is centered at (-3,-12) and passes through (24,-13).

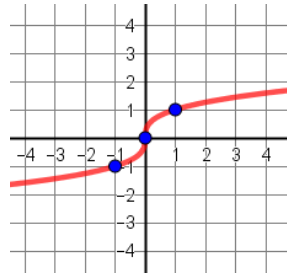
$$y = a\sqrt[3]{x - h} + k$$

Use these given values in the equation to solve for  $a$ .

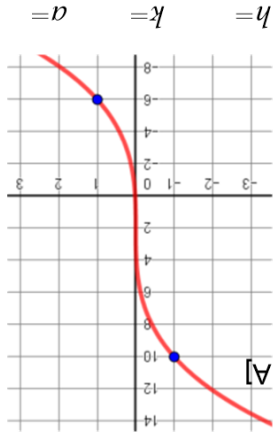
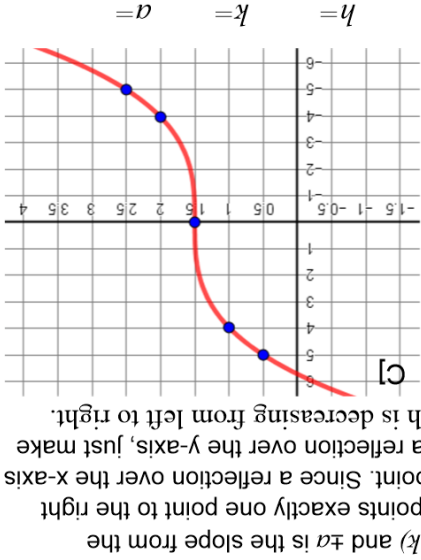
$$\left. \begin{aligned} h &= \\ k &= \\ x &= \\ y &= \end{aligned} \right\}$$

## Graphing Cube Root Functions

Parent graph:  $y = \sqrt[3]{x}$



Shape is a \_\_\_\_\_  
 Center point at ( , )  
 Passes through ( , ) and ( , )  
 Domain: \_\_\_\_\_ Range: \_\_\_\_\_  
 \_\_\_\_\_ from left to right



**Example 3** Write the equation from the graph

$$y = a\sqrt[3]{x - h} + k$$

The center point is  $(h, k)$  and  $\pm a$  is the slope from the endpoint to the guide points exactly one point to the right and left of the center point. Since a reflection over the x-axis is the same graph as a reflection over the y-axis, just make  $a$  negative if the graph is decreasing from left to right.

## Example 1 Describing transformations

$|a| > 1$  vertical **stretch**  
 $|a| < 1$  vertical **shrink**  
 $a < 0$  reflects over **x-axis**

$+k$  translation **up**  
 $-k$  translation **down**

$$y = a\sqrt[3]{b(x - h)} + k$$

$|b| > 1$  horizontal **shrink**  
 $|b| < 1$  horizontal **stretch**  
 $b < 0$  reflects over **y-axis**

$(x - h)$  translation **right**  
 $(x + h)$  translation **left**

\*We won't look at horizontal dilations until PreCalc

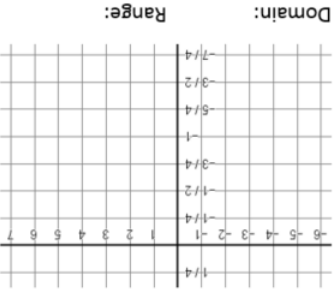
Describe each graph as compared to the parent graph.

A] $y = \frac{1}{2}\sqrt[3]{x} + 4$	B] $y = -\sqrt[3]{x + 5}$	C] $y = \sqrt[3]{-x} + 6$ *warning! Factor out b-value first!	D] $y = 7\sqrt[3]{-x} - 8$
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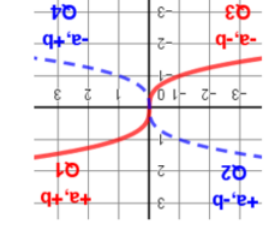
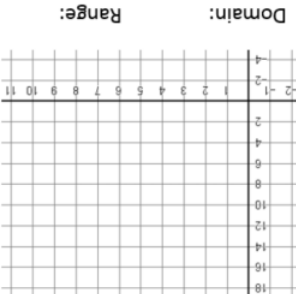
## Example 2 Graphing with transformations

A]  $y = -6\sqrt[3]{x - 2} + 10$   
 B]  $y = -\frac{2}{3}\sqrt[3]{-x - 3} - 1$

Center point  $(h, k)$ :  
 Heading toward:  
 Guide points using  $\pm a/1$ :  
 Y-intercept: (0, )  
 Extra guide point(s): (5, )



Center point  $(h, k)$ :  
 Heading toward:  
 Guide points using  $\pm a/1$ :  
 Y-intercept: (0, )  
 Extra guide point(s): (10, )



Step 1: Plot the center point  $(h, k)$ .  
 Step 2: Use the signs of  $a$  and  $b$  to decide which quadrants the curve is heading toward, then use  $\pm a/1$  to find the guide points in those directions.  
 Step 3: Substitute zero for  $x$  to find the y-intercept. Round to one decimal place when needed.  
 Step 4: Find more guide points. Pick  $x$ 's that make perfect cubes to make mental math easy. Use a calculator to approximate cube roots if needed.