

Radical Graph Moves

Graph square root and cube root functions from several forms.

HIGH SCHOOL • MA.912.AR.7.2

MA.912.AR.7.2 "Given a table, equation or written description of a square root or cube root function, graph that function and determine its key features."

NAME _____

DATE _____

START OR CENTER

For $y = a\sqrt{x-h} + k$, the graph starts at (h,k) . Its domain is $x \geq h$, and its range depends on whether a is positive or negative. For $y = a\sqrt[3]{x-h} + k$, the graph is centered at (h,k) , and both the domain and range are all real numbers.

WORKED EXAMPLE

Graph $y = \sqrt{x + 100} + 50$. State its start, domain, and range.

1. Rewrite $x + 100$ as $x - (-100)$, so $h = -100$ and $k = 50$.
2. The graph starts at $(-100, 50)$.
3. Use radicands 1 and 4: plot $(-99, 51)$ and $(-96, 52)$.
4. Draw the rising curve. Domain: $x \geq -100$. Range: $y \geq 50$.

Answer: Start: $(-100, 50)$; domain: $x \geq -100$; range: $y \geq 50$.

PRACTICE 5 problems

- 1** Graph $y = -\sqrt{x - 2} + 3$. State the start, domain, and range.

ANSWER _____

- 2** Graph $y = \sqrt[3]{x + 1} - 2$. State the center, domain, and range.

ANSWER _____

- 3** The table shows a function. Write its equation, then graph it and state its center.
 x : 0, 1, 8, 27 y : 5, 6, 7, 8

ANSWER _____

- 4** A square root graph starts at $(-4, 1)$ and rises 3 units for each 1-unit increase in $\sqrt{x + 4}$. Write its equation, then state its domain and range.

ANSWER _____

- 5** The table shows a function. Write its equation, then graph it and state its center.
 x : -8, -1, 0, 1, 8 y : 6, 5, 4, 3, 2

ANSWER _____

APPLY IT Show your work

- 1** A game designer models a character's jump-effect height with $H = 2\sqrt{x - 1} + 3$, where x is horizontal screen distance in units. Graph the model. State its start, domain, and range, then find H for $x = 1, 2, 5$, and 10 .

WORK SPACE

ANSWER _____

- 2** An audio club models a signed sound-control response with $V = \sqrt[3]{x - 8} + 4$, where x is the input setting. Graph the model. State its center, domain, and range, then find V for $x = 0, 7, 8$, and 9 .

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A square root graph starts at $(2, -1)$ and passes through $(11, 5)$. Write its equation in the form $y = a\sqrt{x-h} + k$. Then graph it and state its domain and range.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Graph $y = -\sqrt{x - 2} + 3$. State the start, domain, and range.	Start: (2,3); key points: (3,2), (6,1), (11,0); domain: $x \geq 2$; range: $y \leq 3$.
2	Graph $y = \text{cube root}(x + 1) - 2$. State the center, domain, and range.	Center: (-1,-2); key points: (-9,-4), (-1,-2), (7,0); domain: all real numbers; range: all real numbers.
3	The table shows a function. Write its equation, then graph it and state its center. x: 0, 1, 8, 27 y: 5, 6, 7, 8	$y = \text{cube root}(x) + 5$; center: (0,5); domain and range: all real numbers.
4	A square root graph starts at (-4,1) and rises 3 units for each 1-unit increase in $\sqrt{x + 4}$. Write its equation, then state its domain and range.	$y = 3\sqrt{x + 4} + 1$; key points: (-4,1), (-3,4), (0,7), (5,10); domain: $x \geq -4$; range: $y \geq 1$.
5	The table shows a function. Write its equation, then graph it and state its center. x: -8, -1, 0, 1, 8 y: 6, 5, 4, 3, 2	$y = -\text{cube root}(x) + 4$; center: (0,4); domain and range: all real numbers.

PART 2 • APPLY IT

- Start: (1,3); points: (1,3), (2,5), (5,7), (10,9); domain: $x \geq 1$; range: $H \geq 3$.** Use x values that make $x - 1$ equal to perfect squares. The positive coefficient means the square root graph rises from its start.
- Center: (8,4); points: (0,2), (7,3), (8,4), (9,5); domain: all real numbers; range: all real numbers.** Choose inputs so $x - 8$ is a perfect cube. A cube root function extends in both horizontal directions.

CHALLENGE

$y = 2\sqrt{x - 2} - 1$; key points: (2,-1), (3,1), (6,3), (11,5); domain: $x \geq 2$; range: $y \geq -1$.

Accept equivalent interval notation for domains and ranges. For graphs, accept accurate curves that include the stated start or center and key points.