

Radical Graph Moves

Graph square root and cube root functions from equations and descriptions.

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 _____

SQUARE-ROOT AND CUBE-ROOT GRAPHS

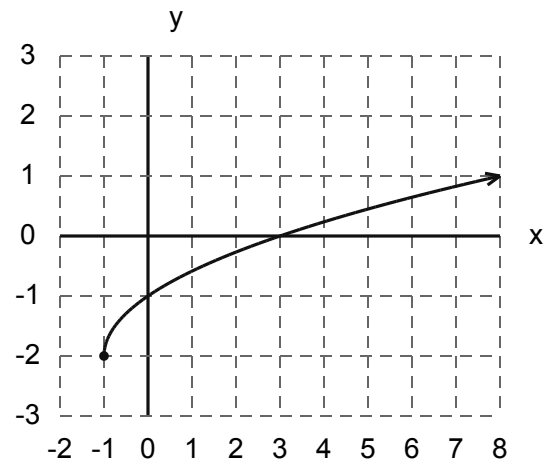
Square-root graphs have an included endpoint where the radicand is zero; their radicands must be nonnegative. Cube-root graphs accept every real input. Use landmark points, then draw a smooth curve. State domain/range, intercepts, sign, increasing/decreasing behavior and end behavior. R means all real numbers. A viewing window is not a domain restriction.

WORKED EXAMPLE

Graph $y = \sqrt{x+1} - 2$ and identify its endpoint, domain, range and intercepts.

1. The radicand is zero at $x = -1$: plot the closed endpoint $(-1, -2)$.
2. Plot $(0, -1)$, $(3, 0)$, $(8, 1)$, then continue to the right.
3. The graph increases; y cannot be less than -2 .

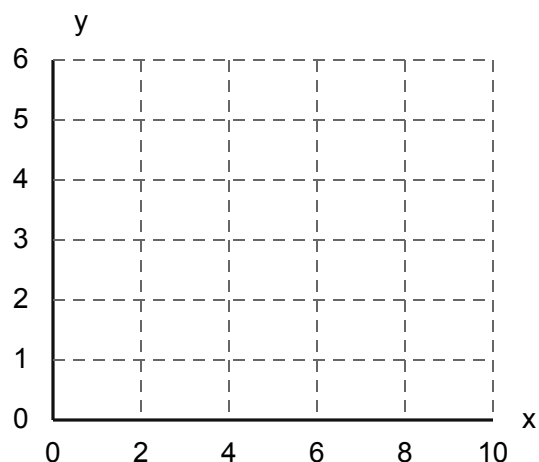
Answer: Endpoint $(-1, -2)$; D: $x \geq -1$; range $y \geq -2$; intercepts $(3, 0), (0, -1)$.



PRACTICE 4 problems

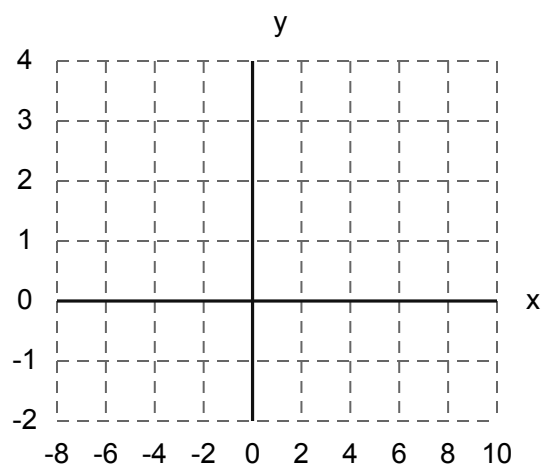
- 1** Graph $y = \sqrt{x-1} + 2$. Give domain/range, endpoint, intercepts and increasing/decreasing behavior.

ANSWER _____



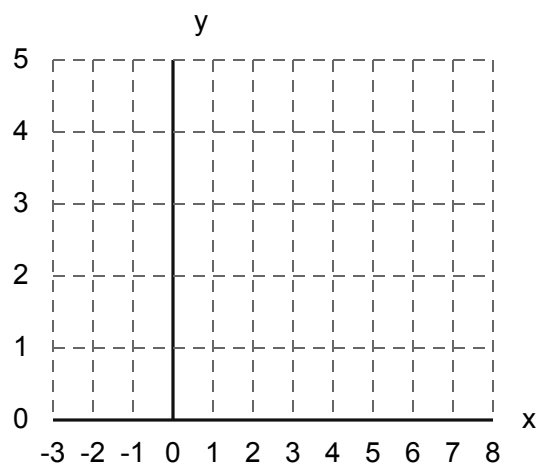
- 2** Graph $y = \sqrt[3]{x-1} + 1$. Give domain/range, both intercepts and increasing/decreasing behavior.

ANSWER _____



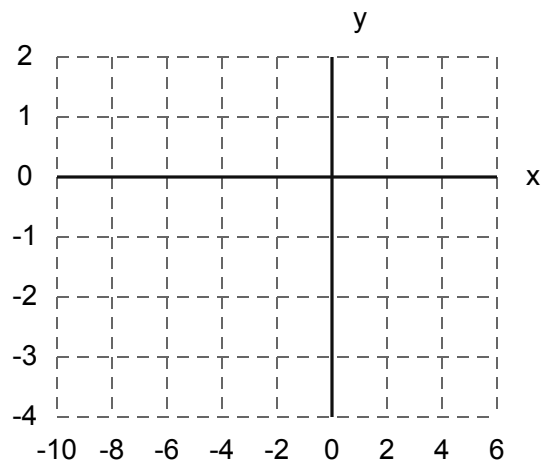
- 3** A translated square-root curve contains $(-2,1), (-1,2), (2,3), (7,4)$, with endpoint $(-2,1)$. Write and graph its equation. Give domain and range.

ANSWER _____



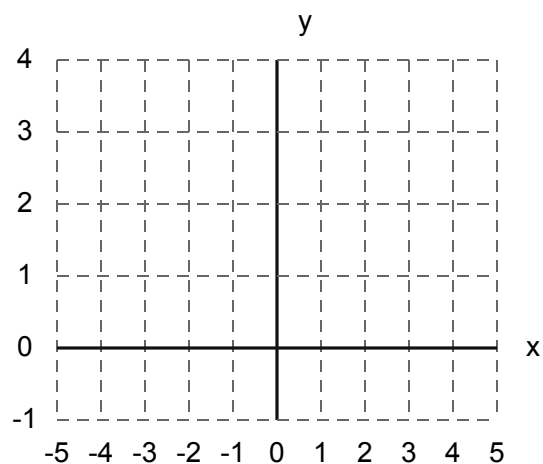
- 4 Translate $y=\sqrt[3]{x}$ left 2 and down 1, with no stretch or reflection. Write and graph the result. Give domain/range and end behavior.

ANSWER _____



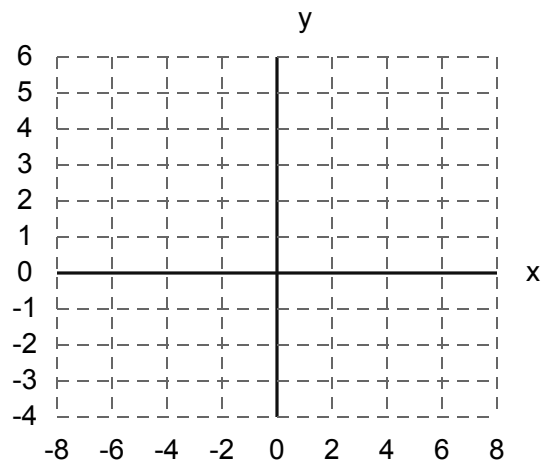
APPLY IT Show your work

- 1 A graphing program displays $y=\sqrt{4-x}$. Sketch it and identify the endpoint, domain/range, both intercepts, monotonic behavior and minimum.



2

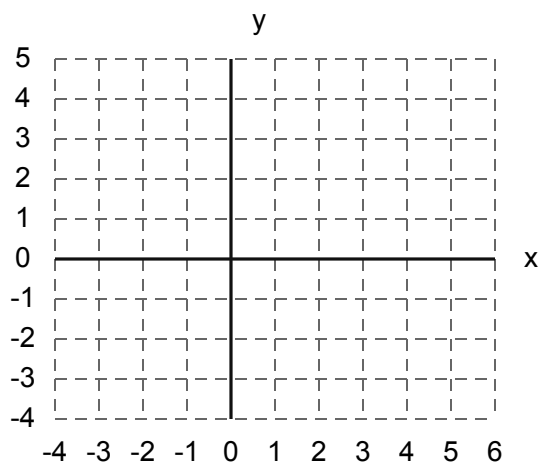
A curve has form $y = a\sqrt[3]{x} + k$ and passes through $(-8, -3), (0, 1), (8, 5)$. Find a and k , graph it, and give both intercepts.



CHALLENGE One step up

Graph $y = -2\sqrt{x+3} + 4$. Give endpoint, domain/range, x-intercept, maximum, sign intervals and end behavior as x grows.

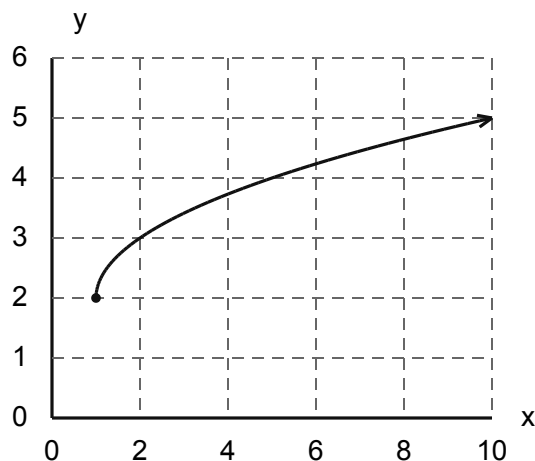
WORK SPACE AND ANSWER



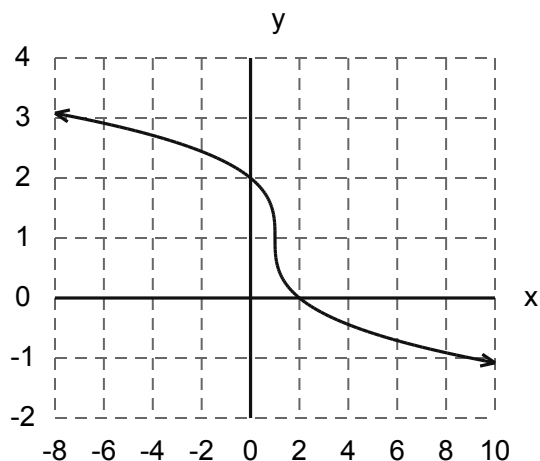
Draw actual curves, with a closed square-root endpoint and continuation arrows elsewhere. Cube-root graphs continue both ways and have no extrema here. Do not join landmark points with straight chords. Equivalent radical notation and interval notation are acceptable.

PRACTICE 1

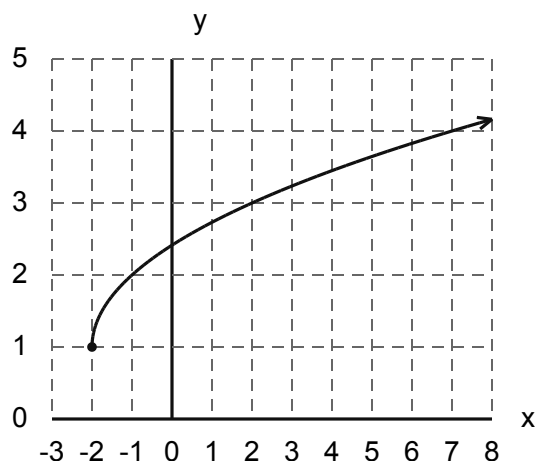
Endpoint (1,2); D: $x \geq 1$; range $y \geq 2$; no x- or y-intercept; increasing.

**PRACTICE 2**

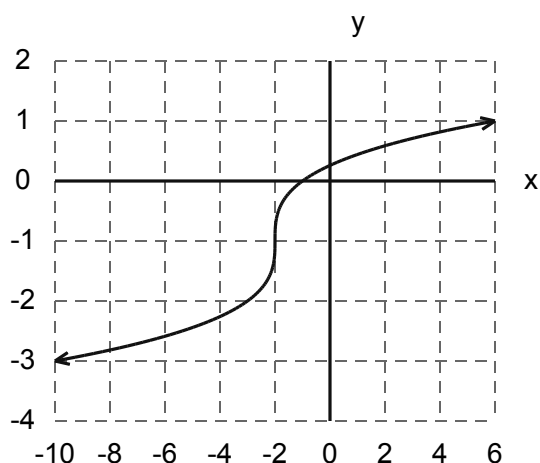
Domain/range R; intercepts (2,0),(0,2); decreasing throughout. Central point (1,1).

**PRACTICE 3**

$y = \sqrt{x+2} + 1$; D: $x \geq -2$; range $y \geq 1$.

**PRACTICE 4**

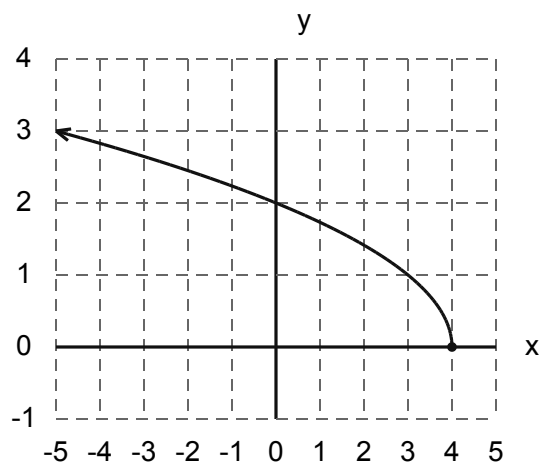
$y = \sqrt[3]{x+2} - 1$; domain/range R; left end down, right end up.



APPLY IT 1

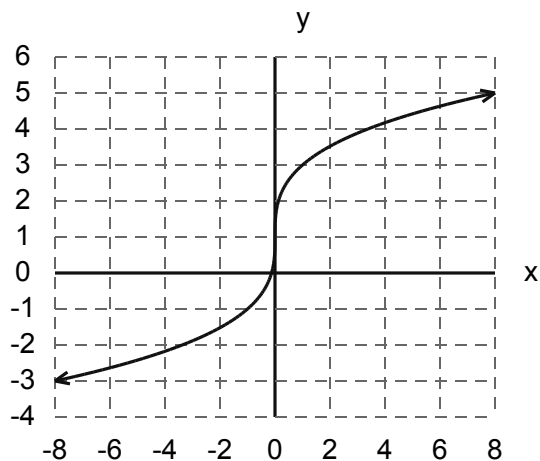
Endpoint $(4,0)$; $D:x \leq 4$; range $y \geq 0$; intercepts $(4,0), (0,2)$; decreasing; minimum 0 at $x=4$.

Require $4-x \geq 0$. Moving left from the endpoint makes the square root increase.



APPLY IT 2

$a=2, k=1; y=2\sqrt[3]{x}+1$. Intercepts $(-1/8,0), (0,1)$.
At $x=0, k=1$. At $x=8, 2a+1=5$, so $a=2$.



CHALLENGE

Endpoint $(-3,4)$; $D:x \geq -3; y \leq 4$; zero $x=1$; max 4 at -3 .
Positive $[-3,1)$, negative $x > 1$. As x grows, y falls without bound.

