LESSON MAKER PRO

Function Graph Lab

Build graphs from rules, points, and boundary dots.

HIGH SCHOOL · HSF-IF.C.7b

CCSS.Math.Content.HSF-IF.C.7b "Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions."

NAME _____ DATE _____

GRAPHING FUNCTION FAMILIES

Start with key input values that make a square root or cube root easy to find. For a transformed graph, use the function rule to find each point. In a piecewise or step function, graph each rule only on its stated interval, and use an open or closed dot at a boundary.

WORKED EXAMPLE

Graph y = sqrt(x + 13) - 8 by listing four key points.

1. Choose x-values that make x + 13 equal 0, 1, 4, and 9.
2. The matching x-values are -13, -12, -9, and -4.
3. Find y: sqrt(0) - 8 = -8, sqrt(1) - 8 = -7, sqrt(4) - 8 = -6, and sqrt(9) - 8 = -5.
4. Plot the points and draw the square root curve starting at the endpoint.

Answer: Key points: (-13,-8), (-12,-7), (-9,-6), and (-4,-5). The endpoint is (-13,-8).

PRACTICE 6 problems

1 Graph y = sqrt(x - 2). List four key points, including the endpoint.

ANSWER _____

2 Graph y = cbrt(x + 7) - 2. List five key points.

ANSWER _____

3 Graph y = |x + 4| - 2. State the vertex and list two other points.

ANSWER _____

4 Graph the step function f(x) = -2 for x < 0, and f(x) = 2 for x >= 0. Describe the two horizontal rays and their boundary dots.

ANSWER _____

5 Graph the piecewise function f(x) = x + 1 for x < 2, and f(x) = -x + 5 for x >= 2. State the boundary dots.

ANSWER _____

6 Graph y = -sqrt(x + 6) + 7. List four key points, including the endpoint.

ANSWER _____

APPLY IT Show your work

1 A gaming club gives badge levels based on the number of tournament matches m a player completes. B(m) = 0 for 0 <= m < 3, B(m) = 1 for 3 <= m < 6, and B(m) = 2 for 6 <= m <= 9. Graph B(m) by describing its horizontal segments and boundary dots. Then find B(2), B(3), and B(8).

WORK SPACE

ANSWER _____

2 An online game assigns a challenge rating R(l) = |l - 4| + 1 for a level number l. Graph the function. State the vertex, then find R(1), R(4), and R(7).

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Graph g(x) = sqrt(x + 4) for -4 <= x < 0, and g(x) = cbrt(x) + 2 for x >= 0. List key points for both pieces. Then explain why the graph has a closed dot at (0,2) instead of an open dot there.

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ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Graph y = sqrt(x - 2). List four key points, including the endpoint.	**Key points: (2,0), (6,2), (18,4), and (38,6). The endpoint is (2,0).**
2	Graph y = cbrt(x + 7) - 2. List five key points.	**Key points: (-7,-2), (-6,-1), (1,0), (20,1), and (57,2).**
3	Graph y = |x + 4| - 2. State the vertex and list two other points.	**Vertex: (-4,-2). Two other points: (-6,0) and (-2,0).**
4	Graph the step function f(x) = -2 for x < 0, and f(x) = 2 for x >= 0. Describe the two horizontal rays and their boundary dots.	**Draw y = -2 for x < 0 with an open dot at (0,-2). Draw y = 2 for x >= 0 with a closed dot at (0,2).**
5	Graph the piecewise function f(x) = x + 1 for x < 2, and f(x) = -x + 5 for x >= 2. State the boundary dots.	**Graph y = x + 1 to the left of x = 2 with an open dot at (2,3). Graph y = -x + 5 for x >= 2 with a closed dot at (2,3).**
6	Graph y = -sqrt(x + 6) + 7. List four key points, including the endpoint.	**Key points: (-6,7), (-5,6), (-2,5), and (3,4). The endpoint is (-6,7).**

PART 2 · APPLY IT

1. **Draw y = 0 from m = 0 closed to m = 3 open, y = 1 from m = 3 closed to m = 6 open, and y = 2 from m = 6 closed to m = 9 closed. B(2) = 0, B(3) = 1, and B(8) = 2.** Use each interval to choose the correct badge level. Closed dots occur where the interval includes the endpoint, and open dots occur where it does not.
2. **The vertex is (4,1). Useful points are (1,4), (4,1), and (7,4). R(1) = 4, R(4) = 1, and R(7) = 4.** The expression inside the absolute value is zero at l = 4, so that gives the vertex. Evaluate the rule at each requested level number.

CHALLENGE

For the square root piece, use (-4,0), (-3,1), and an open dot at (0,2). For the cube root piece, use a closed dot at (0,2), (1,3), and (8,4). The second rule includes x = 0, so (0,2) is closed. The first rule does not include x = 0, so its dot at that same location is open.

Accept equivalent point sets that correctly show the required graph shape and boundary behavior. For graph descriptions, require open dots for excluded endpoints and closed dots for included endpoints.