Graphing Roots and Steps

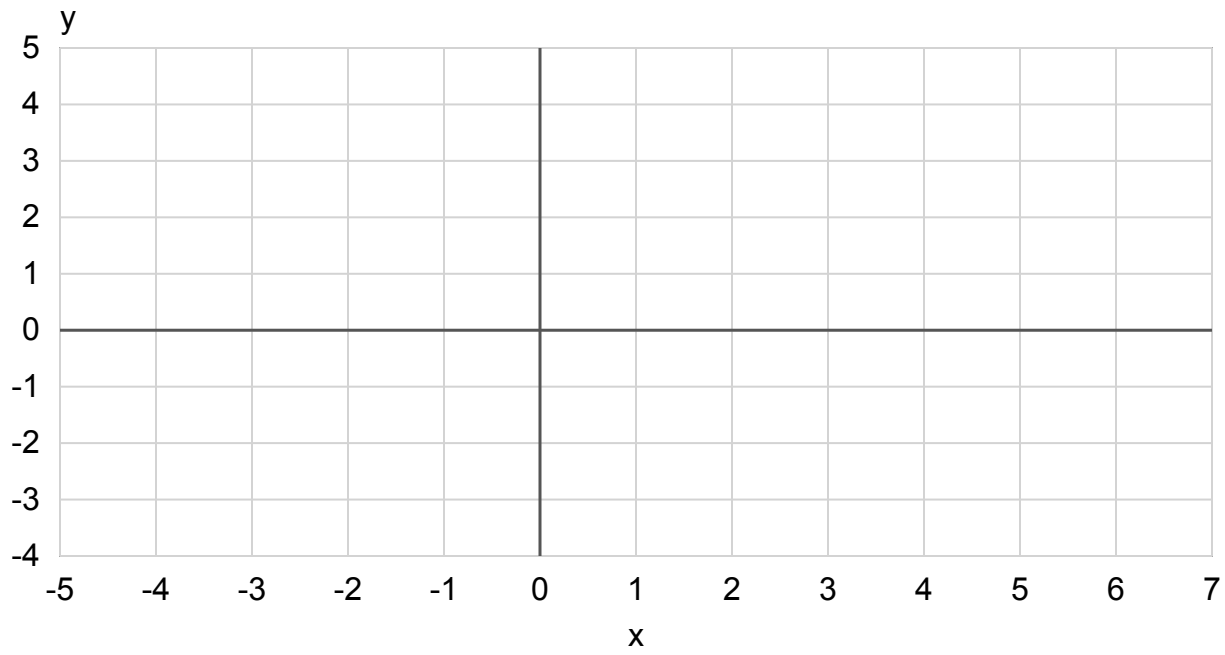
Graph a square-root function and a step function with correct endpoints, domain, and range.

Name: _____ Date: _____

Part 1 - Square-root graph

Graph **f(x) = sqrt(x + 2) - 1** on the grid. The square-root symbol includes everything inside the parentheses. Begin at the endpoint, then sketch a smooth curve that continues to the right. Draw an arrow where the curve leaves the graphing window.

Endpoint symbols: use **o** for an open endpoint (not included) and ● for a closed endpoint (included). This function has a closed starting point.



State the starting point, actual domain, and actual range. Do not use the edges of the graphing window as your answer.

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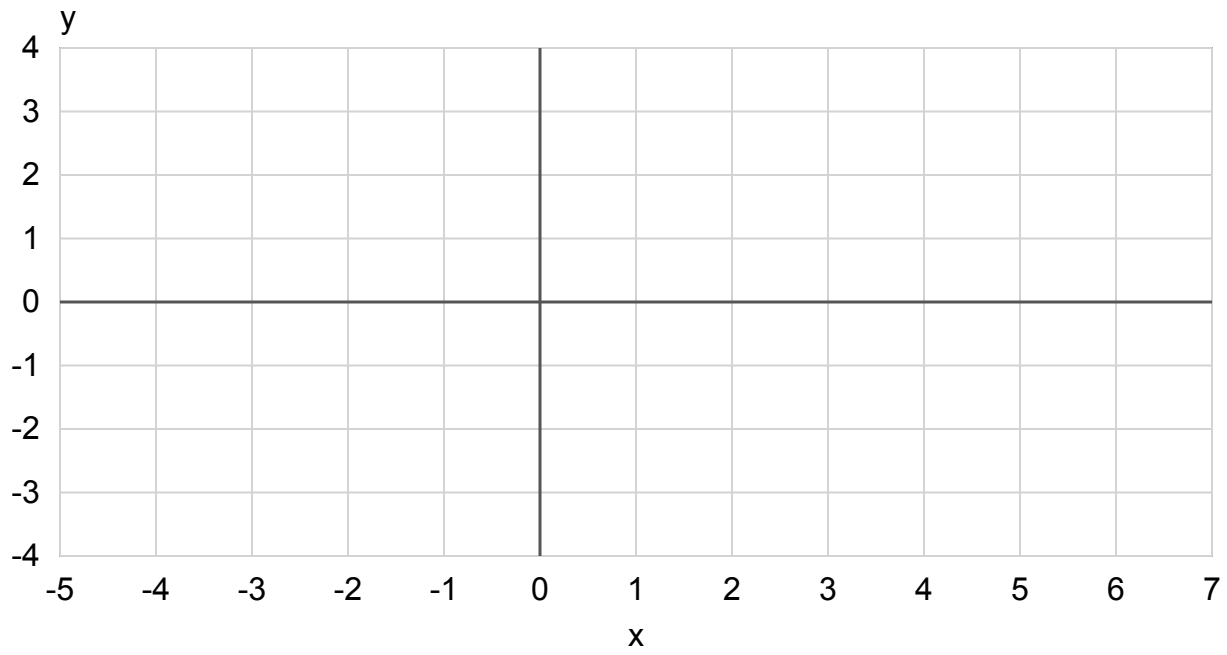
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Part 2 - Piecewise step graph

Graph the step function below. Draw each horizontal piece only on its stated interval. Mark every endpoint with **o** (open, not included) or ● (closed, included).

g(x) = { 2, for -3 ≤ x < 0
-1, for 0 ≤ x < 3
1, for 3 ≤ x ≤ 6 }



Write the actual domain and range. Then name one x-value where there is a jump.

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Teacher notes and key - Part 1

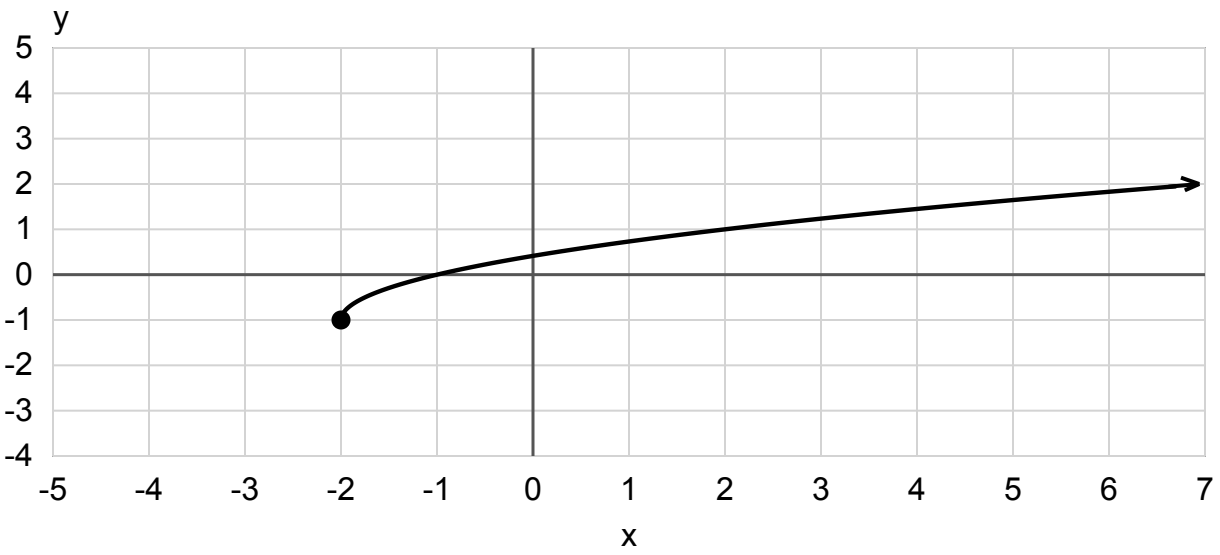
Materials: student worksheet, pencil, eraser, ruler or straightedge, and optional graphing technology for checking after students graph by hand. The two printed coordinate grids are supplied on the student pages.

Setup: Print and supply all student pages, keeping teacher-key pages separate. Ask students to keep the graphing window in view but to read the function and interval symbols before drawing. Students work independently first; technology may be used only to check a completed hand graph.

Teaching script: “A graphing window is only the part of a graph we can see. We decide domain and range from the function and its endpoints, not from the border of the grid. A closed dot means that point belongs to the graph. An open circle means it does not.”

Observe: While circulating, check whether the student begins f at x = -2, y = -1; uses a closed endpoint; curves rightward and upward; and writes inequalities rather than window limits. Ask: “What value makes the radicand zero?”

1. Answer: The graph starts at **(-2, -1)**, shown with a closed point. It passes through (-1, 0), (2, 1), and (7, 2). The curve continues right and upward; the arrow at the right side of the sample graph shows that it does not end at x = 7. Domain: **x ≥ -2**. Range: **y ≥ -1**. The visible right edge x = 7 is not an endpoint of the function.



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Answer key and teaching notes - Part 2

2. Answer: Draw y = 2 from x = -3 through x just before 0: closed at **(-3, 2)**, open at **(0, 2)**. Draw y = -1 from x = 0 through x just before 3: closed at **(0, -1)**, open at **(3, -1)**. Draw y = 1 from x = 3 through x = 6: closed at **(3, 1)** and **(6, 1)**.

The domain is **-3 ≤ x ≤ 6**. The range is **{-1, 1, 2}**. Accept x = 0 or x = 3 as a jump location. The graph window does not change either answer.

Observation method: Use a three-check scan: (1) each horizontal segment has correct left/right limits, (2) shared boundary x-values have one included point and the appropriate excluded point, and (3) domain/range match the graph rule. If needed, point to x = 0 and ask, “Which y-value is g(0)?”

Scoring guide: 1 point for all three correct segment heights; 1 point for correct interval lengths; 1 point for all six endpoint symbols; 1 point for domain; 1 point for range and a valid jump value. For Part 1, look for correct start, shape/direction, domain, and range.

