Graphing Square Root Functions

Name: _____	Date: _____	Score: _____ / 24

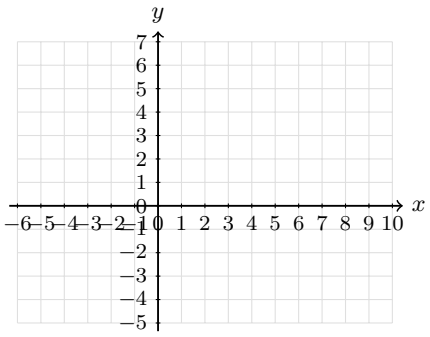
Quick Review

A **square root function** is built from the parent graph $f(x) = \sqrt{x}$. Its graph starts at an endpoint and then grows to the right. For $g(x) = a\sqrt{x-h}+k$, the endpoint is (h, k). The domain begins at $x = h$ because the expression under the radical must be nonnegative, and the range begins at $y = k$ if $a > 0$ or ends at $y = k$ if $a < 0$. Read the endpoint first, then use perfect-square steps like $0, 1, 4, 9$ to plot clean points.

PRACTICE

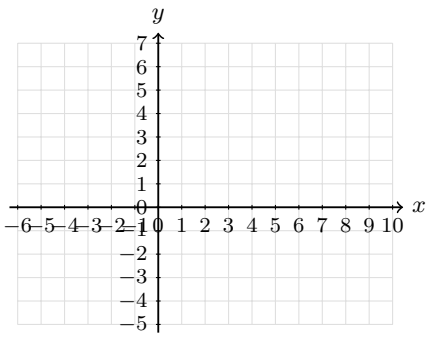
Graph each square-root function or use the graph/table to answer.

1. Graph $y = \sqrt{x}$. Plot the endpoint and three perfect-square points.



Answer: _____

2. Graph $y = \sqrt{x-4}$. Plot the endpoint and at least two more points.



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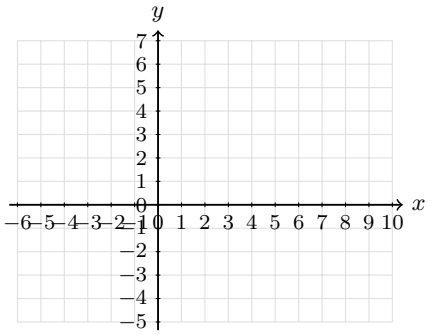
3. Graph $y = \sqrt{x+2}$. Plot the endpoint and three clean points.



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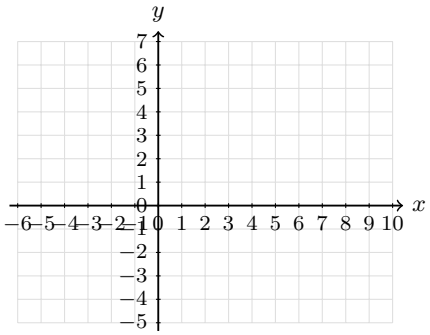
4. Graph $y = \sqrt{x}+3$. Show how the parent graph has moved.



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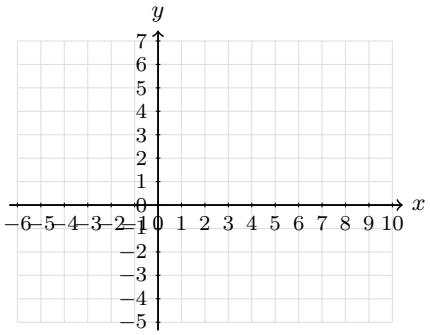
5. Graph $y = -\sqrt{x} + 5$. Make the curve decrease from its endpoint.



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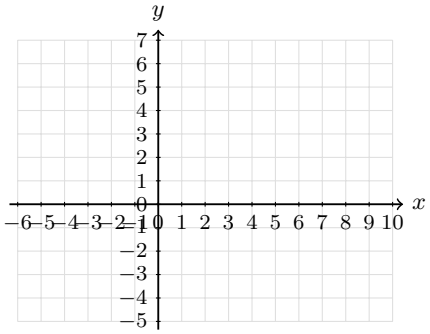
6. Graph $y = \sqrt{x-1} + 2$. Label the endpoint.



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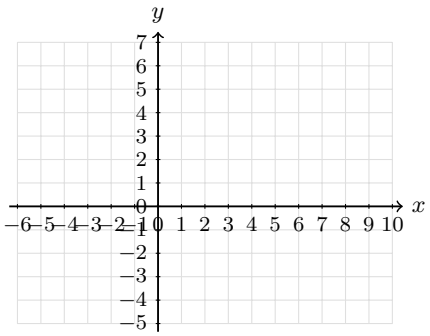
7. Graph $y = 2\sqrt{x}$. Use perfect-square inputs to make the graph accurate.



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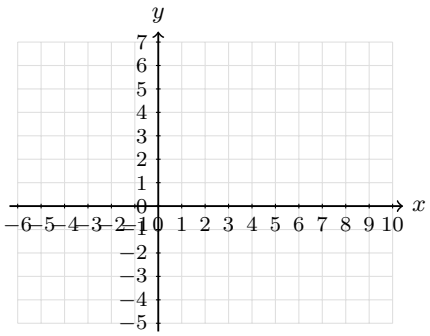
8. Graph $y = -2\sqrt{x} + 6$. Plot the endpoint and two more points.



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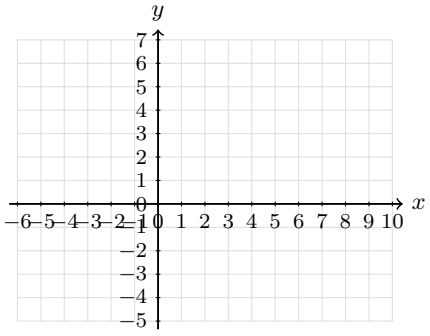
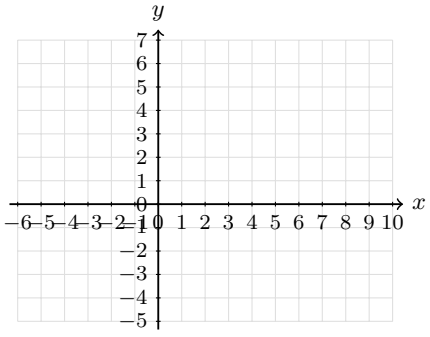
9. Graph $y = \sqrt{x+4} - 2$. Label the endpoint on the coordinate plane.



Answer: _____

10. Graph $y = -\sqrt{x-3} + 1$. Show the reflected square-root curve.



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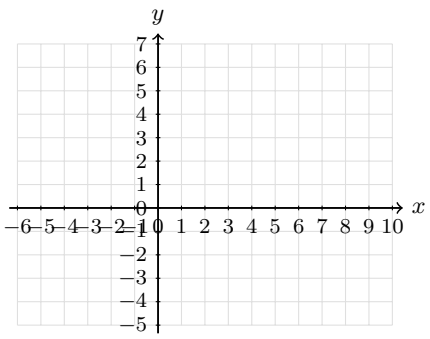
11. Complete the table for $y = \sqrt{x-2}+1$, then graph the points and draw the curve.

x	2	3	6
y			



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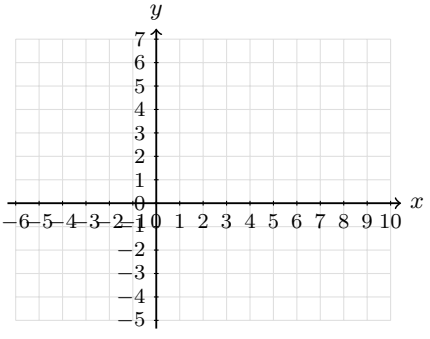
12. Complete the table for $y = 4 - \sqrt{x+1}$, then graph the curve.

x	-1	0	3	8
y				



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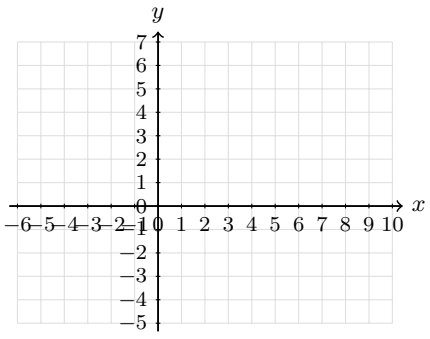
13. Complete the table for $y = \sqrt{x+5}-2$, then graph it.

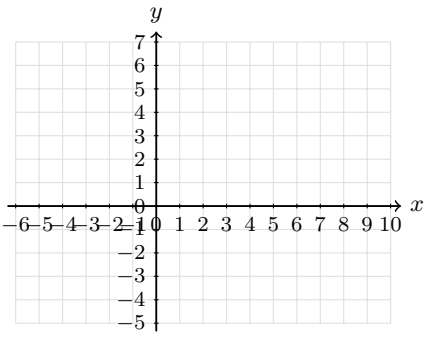
x	-5	-4	-1	4
y				



Answer: _____

14. Complete the table for $y = 2\sqrt{x-1}-3$, then graph it.

x	1	2	5	10
y				



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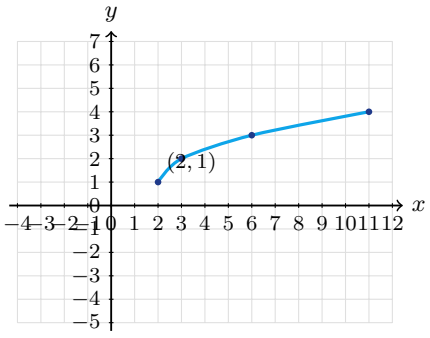
15. Use the graph. What are the endpoint and domain?



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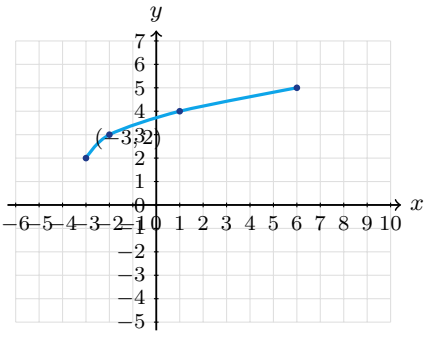
16. Use the graph. Write the domain and range.



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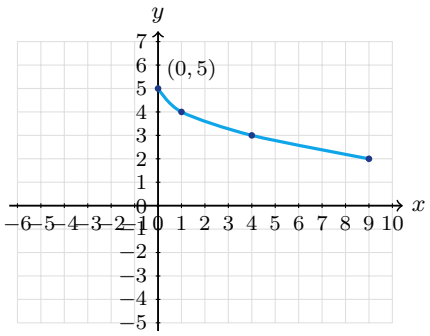
17. Which equation matches the graph: $y = \sqrt{x} + 5$ or $y = 5 - \sqrt{x}$?



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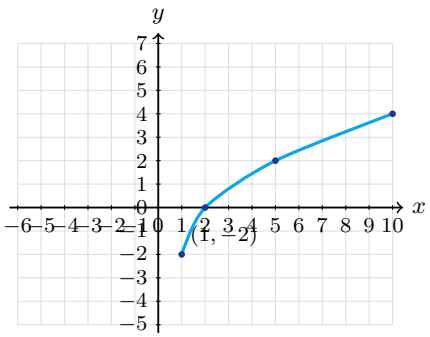
18. Use the graph to find a in $y = a\sqrt{x-1} - 2$.



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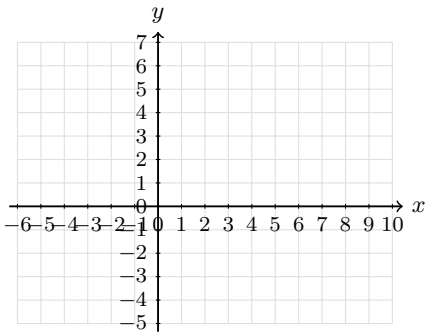
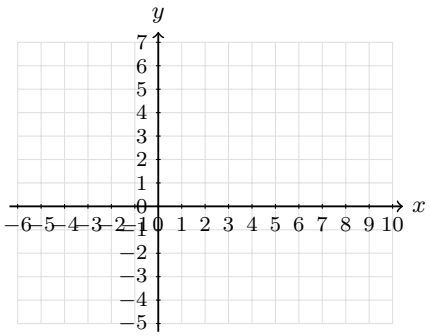
19. A square-root graph starts at $(-2, 1)$ and rises through $(2, 3)$. Write a possible equation, then sketch it.



Answer: _____

20. A square-root graph starts at $(1, 5)$ and passes through $(5, 3)$. Write a possible equation, then sketch it.



Answer: _____

Word Problems

21. A square garden has area 196 square feet. Use a square root to find the side length.

_____

22. A coaster's speed after dropping h meters is modeled by $v(h) = \sqrt{19.6h}$. Find the speed after a 20-meter drop and state the domain in context.

_____

23. The time for one swing of a pendulum is modeled by $T = 2\pi\sqrt{L/9.8}$, where L is the length in meters. Find the swing time when $L = 2.45$ meters.

_____

24. A square display area has area A square inches. Write a function for the side length and find the side length when $A = 81$.

_____

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Answer Keys

1. $(0,0),(1,1)$ $(4,2),(9,3)$
2. $(4,0),(5,1),(8,2)$
3. $(-2,0),(-1,1)$ $(2,2),(7,3)$
4. $(0,3),(1,4)$ $(4,5),(9,6)$
5. $(0,5),(1,4)$ $(4,3),(9,2)$
6. $(1,2),(2,3)$ $(5,4),(10,5)$
7. $(0,0),(1,2)$ $(4,4),(9,6)$
8. $(0,6),(1,4)$ $(4,2),(9,0)$
9. $(-4,-2),(-3,-1)$ $(0,0),(5,1)$
10. $(3,1),(4,0),(7,-1)$
11. $(2,1),(3,2),(6,3)$
12. $(-1,4),(0,3)$ $(3,2),(8,1)$
13. $(-5,-2),(-4,-1)$ $(-1,0),(4,1)$
14. $(1,-3),(2,-1)$ $(5,1),(10,3)$
15. $(2,1);\ x \geq 2$
16. $x \geq -3;\ y \geq 2$
17. $y = 5 - \sqrt{x}$
18. $a = 2$
19. $y = \sqrt{x+2} + 1$
20. $y = 5 - \sqrt{x-1}$
21. 14 ft
22. $v(20) \approx 19.8;\ h \geq 0$
23. $T \approx 3.14$ sec
24. $s(A) = \sqrt{A};\ 9$ in

Step-by-Step Tutor Notes

1. Start at the endpoint $(0,0)$. Then use $x = 1, 4, 9$ because their square roots are $1, 2, 3$.
2. The expression $x - 4$ shifts the parent graph right 4 units, so the endpoint is $(4,0)$.
3. Write $x+2$ as $x-(-2)$, so the endpoint is $(-2,0)$. Add $1, 4, 9$ to the starting x-value.
4. Work one inverse operation at a time and keep both sides balanced. Adding 3 outside the radical moves every parent-graph point up 3 units. After simplifying, the answer is $\begin{matrix}(0,3),(1,4)\\(4,5),(9,6)\end{matrix}$.
5. The negative sign reflects the graph downward, and the $+5$ places the endpoint at $(0,5)$.
6. For $y = \sqrt{x-h} + k$, the endpoint is (h,k). Here that point is $(1,2)$.
7. First identify the feature of the graph or equation that matches the wording of the question. The factor 2 doubles each parent-graph y-value, so the graph rises more steeply. That leads to $\begin{matrix}(0,0),(1,2)\\(4,4),(9,6)\end{matrix}$.
8. Start at $(0,6)$. The coefficient -2 makes the outputs drop by $2, 4, 6$ from that height.
9. The endpoint is $(-4,-2)$. From there, move right by $1, 4, 9$ and up by $1, 2, 3$.
10. The endpoint is $(3,1)$. Because of the negative sign, the curve moves downward as x increases.
11. Substitute each listed x-value. The radicands are $0, 1, 4$, so the outputs are $1, 2, 3$.
12. The radicands are $0, 1, 4, 9$. Subtract their square roots from 4 to get the table values.
13. These x-values make the radicand $0, 1, 4, 9$, which keeps the graph points exact.
14. The endpoint is $(1,-3)$. After that, square-root outputs $1, 2, 3$ become vertical changes of $2, 4, 6$.
15. The graph begins at $(2,1)$ and continues to the right, so the input values start at $x = 2$.
16. The leftmost point is $(-3,2)$, and the graph rises from there. That sets the starting values for x and y.
17. The graph starts at 5 and decreases, so the square-root part must be subtracted from 5.
18. From $(1,-2)$ to $(2,0)$, the square-root input changes by 1 and the output rises 2, so $a = 2$.
19. The endpoint gives $h = -2$ and $k = 1$. Since $(2,3)$ is 4 units right and 2 units up, the parent scale fits.
20. The graph starts at $(1,5)$ and moves downward. Four units to the right, $\sqrt{4} = 2$, so the point drops to 3.
21. If the side length is s, then $s^2 = 196$. Taking the positive square root gives $s = 14$ ft.
22. Substitute $h = 20$: $v = \sqrt{392} \approx 19.8$ m/s. A drop height cannot be negative, so $h \geq 0$.
23. Use the given numbers to build the model, then finish the calculation. $T = 2\pi\sqrt{2.45/9.8} = 2\pi\sqrt{0.25} = 2\pi(0.5) = \pi \approx 3.14$ seconds.
24. Area of a square is $s^2 = A$, so the side length is $s = \sqrt{A}$. When $A = 81$, $s = 9$ inches.

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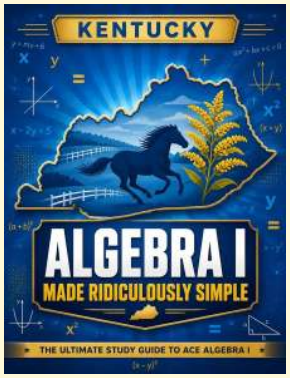

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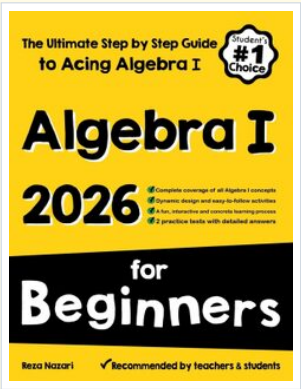

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