Lesson 7–9

Example 1 Graph a Square Root Function

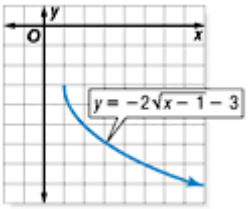
Graph $y = -2\sqrt{x-1} - 3$. State the domain, range, x– and y–intercepts.

Since the radicand cannot be negative, identify the domain.

$x - 1 \geq 0$ Write the expression inside the radicand ≥ 0.

$x \geq 1$ Solve for x.

There is no x– or y–intercept. The graph begins when $x = 1$ and $y = -3$. Make a table of values and graph the function.



x	y
1	–3
2	–5
3	–5.8
4	–6.5
5	–7

From the graph, you can see that the domain is $x \geq 1$, and the range is $y \leq -3$. There is no x–intercept and no y–intercept.

Example 2 Solve a Square Root Problem

GEOMETRY The surface area of any sphere can be found using the formula $A = 4\pi r^2$, where A is the surface area and r is the radius of the sphere.

a. Solve the formula for r.

$A = 4\pi r^2$ Formula for surface area

$\frac{A}{4\pi} = r^2$ Divide each side by 4π.

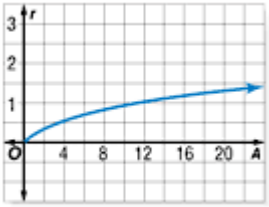
$r = \sqrt{\frac{A}{4\pi}}$ Take the square root of both sides.

Area is always positive, so just consider the positive root.

b. Graph the function. State the domain and range.

Make a table of values and graph the function.

A	*r*
0	0
5	0.6
10	0.9
15	1.1
20	1.3



The domain is $A \geq 0$ and the range is $r \geq 0$.

c. Find the radius of a sphere whose surface area is 30.

$r = \sqrt{\frac{A}{4\pi}}$ Original equation

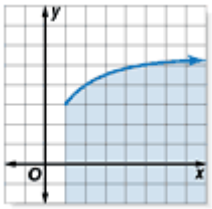
$r = \sqrt{\frac{30}{4\pi}}$ Replace A with 30.

$r \approx 1.5$ Evaluate with a calculator.

Example 3 Graph a Square Root Inequality

a. Graph $y \leq \sqrt{x-1} + 3$.

Graph the related equation $y = \sqrt{x - 1} + 3$. Since the boundary should be included, the graph should be a solid line.



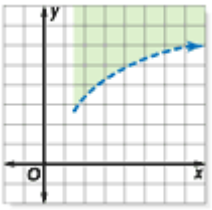
The range includes only nonnegative real numbers, so the graph is above the x–axis. The domain includes $x = 1$ and the values of x to the right of $x = 1$. Select a point from one of the half–planes and test its ordered pair.

Test (3, 3).
$3 \leq \sqrt{3 - 1} + 3$
$3 \leq \sqrt{2} + 3$ true

Shade the half plane that includes the point (3, 3).

b. Graph $y > \sqrt{3x - 4} + 2$.

Graph the related equation $y = \sqrt{3x - 4} + 2$. Since the boundary should not be included, the graph should be dashed.



The domain includes values for $x > \frac{4}{3}$, so the graph is to the right of $x = \frac{4}{3}$. Select a point from one of the half–planes and test its ordered pair.

Test (3, 2).
$y > \sqrt{3x - 4} + 2$
$2 > \sqrt{3(3) - 4} + 2$
$2 > \sqrt{5} + 2$ false
Shade the region that does not include (3, 2).