

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.

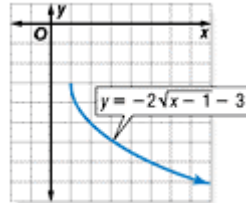
Since the radicand cannot be negative, identify the domain.

$$\begin{aligned}x - 1 &\geq 0 \\x &\geq 1\end{aligned}$$

Write the expression inside the radicand ≥ 0 .
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 .

$$\begin{aligned}A &= 4\pi r^2 \\ \frac{A}{4\pi} &= r^2 \\ r &= \sqrt{\frac{A}{4\pi}}\end{aligned}$$

Formula for surface area

Divide each side by 4π .

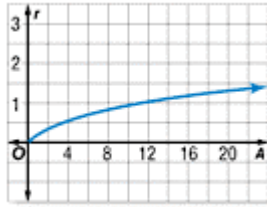
Take the square root of both sides.

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.

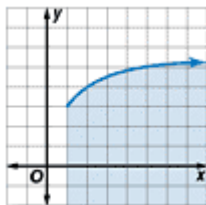
$$r \approx 1.5$$

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 $(3, 3)$.

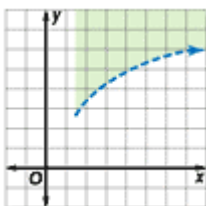
$$3 \leq \sqrt{3-1} + 3$$

$$3 \leq \sqrt{2} + 3 \quad \text{true}$$

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 $x \geq \frac{4}{3}$, 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 $(3, 2)$.

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

$$2 > \sqrt{3(3)-4} + 2$$

$$2 > \sqrt{5} + 2 \quad \text{false}$$

Shade the region that does not include $(3, 2)$.