







Lesson 11-1

Objective - To simplify rational and irrational square roots.

Reals	
Rationals	Irrationals
$\sqrt{0} = 0$	$\sqrt{2} \approx 1.414$
$\sqrt{1} = 1$	$\sqrt{3} \approx 1.732$
$\sqrt{4} = 2$	$\sqrt{5} \approx 2.236$
$\sqrt{9} = 3$	$\sqrt{6} \approx 2.449$
$\sqrt{16} = 4$	$\sqrt{7} \approx 2.646$
$\sqrt{25} = 5$	$\sqrt{8} \approx 2.828$

For all real values of \sqrt{n} , $n \geq 0$.

Recognizing Rational Roots

Rational Roots	Perfect Squares?
$\sqrt{0} = 0$	0
$\sqrt{1} = 1$	1 
$\sqrt{4} = 2$	4 
$\sqrt{9} = 3$	9 
$\sqrt{16} = 4$	16 
$\sqrt{25} = 5$	25 
$\sqrt{36} = 6$	36 
$\sqrt{49} = 7$	49
$\sqrt{64} = 8$	64

Identify each root as rational or irrational.

- | | |
|---------------------------|---|
| 1) $\sqrt{16}$ rational | 6) $\sqrt{0}$ rational |
| 2) $\sqrt{49}$ rational | 7) $\sqrt{57}$ irrational |
| 3) $\sqrt{18}$ irrational | 8) $\sqrt{121}$ rational |
| 4) $-\sqrt{25}$ rational | 9) $-\sqrt{99}$ irrational |
| 5) $\sqrt{20}$ irrational | 10) $\sqrt{-4}$ Neither (not a Real number) |

Between what two whole numbers does the irrational root lie?

- | | |
|--|---|
| 1) $\sqrt{10}$
$\sqrt{9} < \sqrt{10} < \sqrt{16}$
$3 < \sqrt{10} < 4$ | 3) $\sqrt{104}$
$\sqrt{100} < \sqrt{104} < \sqrt{121}$
$10 < \sqrt{104} < 11$ |
| 2) $\sqrt{20}$
$\sqrt{16} < \sqrt{20} < \sqrt{25}$
$4 < \sqrt{20} < 5$ | 4) $\sqrt{57}$
$\sqrt{49} < \sqrt{57} < \sqrt{64}$
$7 < \sqrt{57} < 8$ |

Evaluate. Round to the nearest hundredth when necessary.

- | | |
|-----------------------------|--|
| 1) $\sqrt{121} = 11$ | 4) $\pm\sqrt{81} = \pm 9$
9 or -9 |
| 2) $-\sqrt{400} = -20$ | 5) $\pm\sqrt{18} \approx \pm 4.24$ |
| 3) $\sqrt{71} \approx 8.43$ | 6) $2 \pm \sqrt{99} \approx 2 + 9.95$
or $2 - 9.95$
11.95 or -7.95 |

Evaluate when $a = 2$, $b = 3$, and $c = -2$. Round to nearest hundredth when necessary.

- | | |
|---|---|
| 1) $\sqrt{b^2 - 4ac}$
$\sqrt{3^2 - 4(2)(-2)}$
$\sqrt{9 + 16} = \sqrt{25} = 5$ | 2) $\frac{\sqrt{b^2 - 4ac}}{2a}$
$\frac{\sqrt{3^2 - 4(2)(-2)}}{2(2)}$
$\frac{\sqrt{9 + 16}}{4} = \frac{\sqrt{25}}{4} = \frac{5}{4}$ |
|---|---|

Lesson 11-1 (cont.)

Evaluate when $a = -5$, $b = 2$, and $c = -1$. Round to nearest hundredth when necessary.

$$3) \sqrt{b^2 - 4ac}$$

$$\sqrt{2^2 - 4(-5)(-1)}$$

$$\sqrt{4 - 20} = \sqrt{-16}$$

No Real Root

$$4) \frac{\sqrt{a^2} - \sqrt{b^2}}{2c}$$

$$\frac{\sqrt{(-5)^2} - \sqrt{2^2}}{2(-1)}$$

$$\frac{\sqrt{25} - \sqrt{4}}{-2}$$

$$\frac{5 - 2}{-2} = -\frac{3}{2}$$

Evaluate when $a = 2$, $b = 3$, and $c = -2$. Round to nearest hundredth when necessary.

$$5) -b \pm \sqrt{b^2 - 4ac}$$

$$-3 \pm \sqrt{3^2 - 4(2)(-2)}$$

$$-3 \pm \sqrt{25}$$

$$-3 \pm 5$$

$$\begin{array}{l} \swarrow \quad \searrow \\ -3 + 5 \quad -3 - 5 \\ \hline 2 \quad \text{or} \quad -8 \end{array}$$

$$6) \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-3 \pm \sqrt{3^2 - 4(2)(-2)}}{2(2)}$$

$$\frac{-3 \pm \sqrt{25}}{4}$$

$$\frac{-3 + 5}{4} = \frac{1}{2}$$

$$\frac{-3 - 5}{4} = -2$$

Domains for Real Roots

State the domain for x in each root below.

$$1) \sqrt{x}$$

$$\{x : x \in \text{Reals}, x \geq 0\}$$

$$2) \sqrt{x+4}$$

$$\{x : x \in \text{Reals}, x \geq -4\}$$

$$x+4 \geq 0$$

$$\frac{-4 - 4}{x} \geq -4$$

$$3) \sqrt{x-5}$$

$$\{x : x \in \text{Reals}, x \geq 5\}$$

$$x-5 \geq 0$$

$$\frac{+5 + 5}{x} \geq 5$$

Domains for Real Roots

State the domain for x in each root below.

$$4) \sqrt{2x}$$

$$\{x : x \in \text{Reals}, x \geq 0\}$$

$$\frac{2x \geq 0}{2} \quad \frac{0}{2}$$

$$x \geq 0$$

$$5) \sqrt{5x-1}$$

$$\{x : x \in \text{Reals}, x \geq \frac{1}{5}\}$$

$$5x-1 \geq 0$$

$$\frac{+1 + 1}{5} \geq \frac{1}{5}$$

$$x \geq \frac{1}{5}$$

State the domain of the given functions.

$$6) y = \frac{3}{\sqrt{x}}$$

$$\text{Domain: } x > 0$$

$$8) y = \frac{5}{\sqrt{x-3}}$$

$$\text{Domain: } x \geq 0, x \neq 9$$

$$7) y = \frac{5x}{x-4}$$

$$\text{Domain: } x \in \text{Reals}, x \neq 4$$

$$9) y = \frac{2(x+4)}{(x-3)(2x+5)}$$

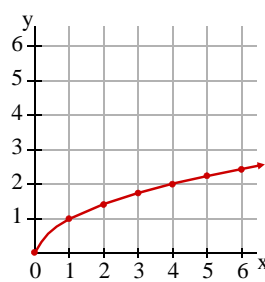
$$\text{Domain: } x \in \text{Reals}, x \neq 3, x \neq -\frac{5}{2}$$

Graphs of Square Root Functions

Graph. State the domain and range.

$$y = \sqrt{x}$$

x	y
0	$\sqrt{0} = 0$
1	$\sqrt{1} = 1$
2	$\sqrt{2} \approx 1.4$
3	$\sqrt{3} \approx 1.7$
4	$\sqrt{4} = 2$
5	$\sqrt{5} \approx 2.2$
6	$\sqrt{6} \approx 2.4$

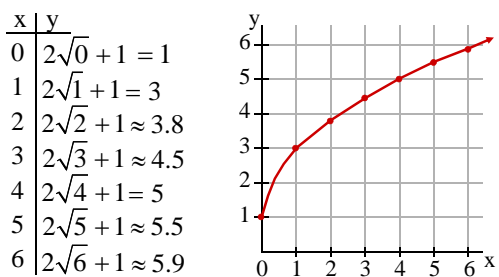


Domain: $x \geq 0$ Range: $y \geq 0$

Lesson 11-1 (cont.)

Graph. State the domain and range.

$$y = 2\sqrt{x} + 1$$



State the domain and range of the given functions.

1) $y = \sqrt{x} + 1$

Domain: $x \geq 0$

Range: $y \geq 1$

3) $y = 2\sqrt{x-1}$

Domain: $x \geq 1$

Range: $y \geq 0$

2) $y = \sqrt{x+3}$

Domain: $x \geq -3$

Range: $y \geq 0$

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

Domain: $x \geq -4$

Range: $y \geq -2$