

**LESSON**  
**11-5**

**Review**  
**Square-Root Functions**

Find the domain of each square-root function. Show your work.

1.  $y = \sqrt{x-5}$

$$\begin{array}{r} x-5 \geq 0 \\ +5 \quad +5 \end{array}$$

$$x \geq 5$$

2.  $y = \sqrt{10-2x}$

$$\begin{array}{r} 10-2x \geq 0 \\ -10 \quad -10 \\ \hline -2x \geq -10 \\ \hline x \leq 5 \end{array}$$

$$x \leq 5$$

3.  $y = 4\sqrt{x+8}$

$$\begin{array}{r} x+8 \geq 0 \\ -8 \quad -8 \end{array}$$

$$x \geq -8$$

Complete each function table. Then graph each square-root function.

4.  $y = \sqrt{x-2}$

$$\begin{array}{r} x-2 \geq 0 \\ +2 \quad +2 \end{array}$$

x	y
2	$\sqrt{2-2} = \sqrt{0} = 0$
3	$\sqrt{3-2} = \sqrt{1} = 1$
6	$\sqrt{6-2} = \sqrt{4} = 2$
11	$\sqrt{11-2} = \sqrt{9} = 3$

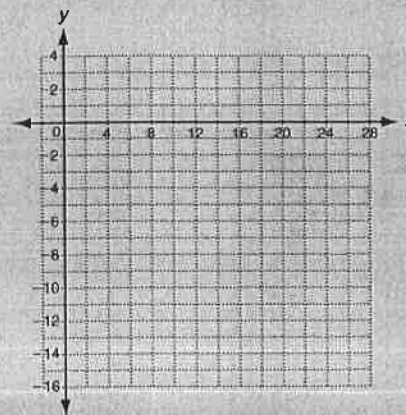
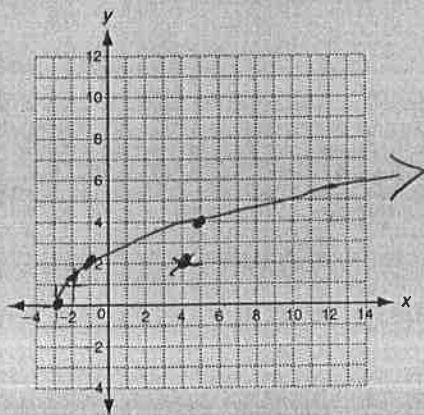
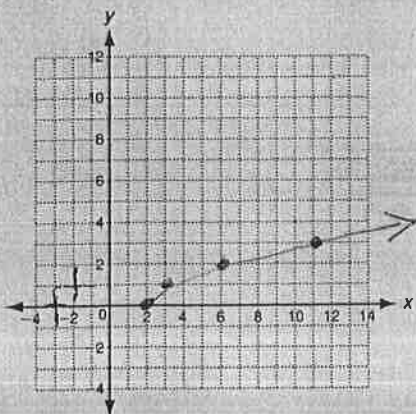
5.  $y = \sqrt{2x+6}$

$$\begin{array}{r} 2x+6 \geq 0 \\ -6 \quad -6 \\ \hline 2x \geq -6 \\ \hline x \geq -3 \end{array}$$

x	y
-3	$\sqrt{2(-3)+6} = \sqrt{-6+6} = \sqrt{0} = 0$
-2	$\sqrt{2(-2)+6} = \sqrt{-4+6} = \sqrt{2} = 1.4$
-1	$\sqrt{2(-1)+6} = \sqrt{-2+6} = \sqrt{4} = 2$
5	$\sqrt{2(5)+6} = \sqrt{10+6} = \sqrt{16} = 4$
12	$\sqrt{2(12)+6} = \sqrt{24+6} = \sqrt{30} = 5.5$

~~6.  $y = -2\sqrt{x-3}$~~

x	y





## Practice B

### Radical Expressions

Simplify. All variables represent nonnegative numbers.

$$\begin{aligned} 1. \sqrt{32} \\ &= \sqrt{16} \cdot \sqrt{2} \\ &= 4\sqrt{2} \end{aligned}$$

$$\begin{aligned} 2. \sqrt{28} \\ &= \sqrt{4} \sqrt{7} \\ &= 2\sqrt{7} \end{aligned}$$

$$\begin{aligned} 3. \sqrt{x^4 y^3} \\ &= \sqrt{x^4} \sqrt{y^3} \\ &= x^2 y \sqrt{y} \end{aligned}$$

$$\begin{aligned} 4. \sqrt{147} \\ &= \sqrt{49} \sqrt{3} \\ &= 7\sqrt{3} \end{aligned}$$

$$\begin{aligned} 5. \sqrt{45} \\ &= \sqrt{9} \sqrt{5} \\ &= 3\sqrt{5} \end{aligned}$$

$$\begin{aligned} 6. \sqrt{36x^4 y^5} \\ &= \sqrt{36} \sqrt{x^4} \sqrt{y^5} \\ &= 6x^2 \sqrt{y^4} \sqrt{y} \\ &= 6x^2 y^2 \sqrt{y} \end{aligned}$$

$$\begin{aligned} 7. \sqrt{\frac{7}{25}} \\ &= \frac{\sqrt{7}}{\sqrt{25}} \\ &= \frac{\sqrt{7}}{5} \end{aligned}$$

$$\begin{aligned} 8. \sqrt{\frac{3b^2}{27b^4}} \\ &= \sqrt{\frac{1}{9b^2}} \\ &= \frac{\sqrt{1}}{\sqrt{9b^2}} = \frac{1}{\sqrt{9} \sqrt{b^2}} = \frac{1}{3b} \end{aligned}$$

$$\begin{aligned} 9. \sqrt{\frac{m^3}{121n^4}} \\ &= \frac{\sqrt{m^3}}{\sqrt{121} \sqrt{n^4}} = \frac{m\sqrt{m}}{11n^2} \end{aligned}$$

$$\begin{aligned} 10. \sqrt{\frac{10b^4}{2b^3}} \\ &= \sqrt{5b} \end{aligned}$$

$$\begin{aligned} 11. \sqrt{\frac{9y^8}{36y^2}} \\ &= \sqrt{\frac{y^4}{4}} \\ &= \frac{\sqrt{y^4}}{\sqrt{4}} = \frac{y^2}{2} \end{aligned}$$

$$\begin{aligned} 12. \sqrt{\frac{40m^3}{10n^4}} \\ &= \sqrt{\frac{4m^3}{n^4}} \\ &= \frac{\sqrt{4} \sqrt{m^3}}{\sqrt{n^4}} = \frac{2m\sqrt{m}}{n^2} \end{aligned}$$



**LESSON**  
**117**

**Practice A**

**Adding and Subtracting Radical Expressions**

Add or subtract.

1.  $2\sqrt{5} + 6\sqrt{5} = 8\sqrt{5}$

2.  $4\sqrt{2} - 6\sqrt{2} = -2\sqrt{2}$

3.  $3\sqrt{m} + 10\sqrt{m} = 13\sqrt{m}$

4.  $\sqrt{7} + 6\sqrt{13} = \text{can't combine}$

5.  $7\sqrt{10} + 1\sqrt{10} - 4\sqrt{10} = 4\sqrt{10}$

6.  $\sqrt{b} + 6\sqrt{2b} - 5\sqrt{b} = -4\sqrt{b} + 6\sqrt{2b}$

Simplify each expression.

7.  $\sqrt{50} + \sqrt{32}$   
 $\sqrt{25}\sqrt{2} + \sqrt{16}\sqrt{2}$   
 $5\sqrt{2} + 4\sqrt{2}$   
 $9\sqrt{2}$

8.  $\sqrt{27} + \sqrt{192}$   
 $\sqrt{9}\sqrt{3} + \sqrt{64}\sqrt{3}$   
 $3\sqrt{3} + 8\sqrt{3}$   
 $11\sqrt{3}$

9.  $\sqrt{20} + \sqrt{80}$   
 $\sqrt{4}\sqrt{5} + \sqrt{16}\sqrt{5}$   
 $2\sqrt{5} + 4\sqrt{5}$   
 $6\sqrt{5}$

10.  $\sqrt{162} + \sqrt{48}$   
 $\sqrt{81}\sqrt{2} + \sqrt{16}\sqrt{3}$   
 $9\sqrt{2} + 4\sqrt{3}$

11.  $4\sqrt{5} + \sqrt{200}$   
 $4\sqrt{5} + \sqrt{100}\sqrt{2}$   
 $4\sqrt{5} + 10\sqrt{2}$

12.  $2\sqrt{12} + 6\sqrt{3}$   
 $2\sqrt{4}\sqrt{3} + 6\sqrt{3}$   
 $2 \cdot 2\sqrt{3} + 6\sqrt{3}$   
 $4\sqrt{3} + 6\sqrt{3}$   
 $10\sqrt{3}$

13.  $\sqrt{25x} + \sqrt{16x}$   
 $\sqrt{25}\sqrt{x} + \sqrt{16}\sqrt{x}$   
 $5\sqrt{x} + 4\sqrt{x}$   
 $9\sqrt{x}$

13.  $\sqrt{48x} + \sqrt{192x}$   
 $\sqrt{16}\sqrt{3}\sqrt{x} + \sqrt{64}\sqrt{3}\sqrt{x}$   
 $4\sqrt{3x} + 8\sqrt{3x}$   
 $12\sqrt{3x}$

14.  $\sqrt{48t} + \sqrt{243t} + 3\sqrt{3t}$   
 $\sqrt{16}\sqrt{3}\sqrt{t} + \sqrt{81}\sqrt{3}\sqrt{t} + 3\sqrt{3t}$   
 $4\sqrt{3t} + 9\sqrt{3t} + 3\sqrt{3t}$   
 $16\sqrt{3t}$

## LESSON

## Practice B

## Multiplying and Dividing Radical Expressions

Multiply. Write each product in simplest form.

1.  $3\sqrt{10y}\sqrt{6y}$

$$3\sqrt{60y^2}$$

$$3\sqrt{60}\sqrt{y^2}$$

$$3\sqrt{4}\sqrt{15}\sqrt{y^2}$$

$$6y\sqrt{15}$$

4.  $\sqrt{2}(\sqrt{7}-5)$

$$\sqrt{14} - 5\sqrt{2}$$

2.  $\sqrt{8}(\sqrt{12}-\sqrt{2})$

$$\sqrt{96} - \sqrt{16}$$

$$\sqrt{16}\sqrt{6} - 4$$

$$4\sqrt{6} - 4$$

~~$$\sqrt{2x}(\sqrt{5}+\sqrt{2x})$$~~

$$\sqrt{10x} + \sqrt{4x^2}$$

$$\sqrt{10x} + \sqrt{4}\sqrt{x^2}$$

$$\sqrt{10x} + 2x$$

6.  $(4+\sqrt{3})(2-\sqrt{3})$

$$8 - 4\sqrt{3} + 2\sqrt{3} - \sqrt{9}$$

$$8 - 2\sqrt{3} - 3$$

$$5 - 2\sqrt{3}$$

7.  $\sqrt{5}(\sqrt{2}-\sqrt{6})$

$$\sqrt{10} - \sqrt{30}$$

8.  $\sqrt{5}(\sqrt{2}+\sqrt{8})$

$$\sqrt{10} + \sqrt{40}$$

$$\sqrt{10} + \sqrt{4}\sqrt{10}$$

$$\sqrt{10} + 2\sqrt{10}$$

$$3\sqrt{10}$$

9.  $(5+\sqrt{2})(6-\sqrt{2})$

$$30 - 5\sqrt{2} + 6\sqrt{2} - \sqrt{4}$$

$$30 + \sqrt{2} - 2$$

$$28 + \sqrt{2}$$

Simplify each quotient.

10.  $\frac{\sqrt{2}}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}} = \frac{\sqrt{12}}{\sqrt{36}}$

$$= \frac{\sqrt{4}\sqrt{3}}{6}$$

$$= \frac{2\sqrt{3}}{6} = \frac{\sqrt{3}}{3}$$

11.  $\frac{\sqrt{10}}{\sqrt{11}} \cdot \frac{\sqrt{11}}{\sqrt{11}} = \frac{\sqrt{110}}{\sqrt{121}}$

$$= \frac{\sqrt{110}}{11}$$

12.  $\frac{\sqrt{13}}{\sqrt{50t}} \cdot \frac{\sqrt{50t}}{\sqrt{50t}} = \frac{\sqrt{650t}}{\sqrt{2500t^2}}$

$$= \frac{\sqrt{25}\sqrt{26}}{\sqrt{2500}\sqrt{t^2}} = \frac{5\sqrt{26}}{50t}$$

$$= \frac{\sqrt{26}}{10t}$$

13.  $\frac{\sqrt{3}}{\sqrt{3a}} \cdot \frac{\sqrt{3a}}{\sqrt{3a}} = \frac{\sqrt{9a}}{\sqrt{9a^2}}$

$$= \frac{3\sqrt{a}}{3a} = \frac{\sqrt{a}}{a}$$

14.  $\frac{\sqrt{8x}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{40x}}{\sqrt{25}}$

$$= \frac{\sqrt{4}\sqrt{10}\sqrt{x}}{5}$$

$$= \frac{2\sqrt{10x}}{5}$$



## Practice B

### Solving Radical Equations

Solve each equation. Check your answer.

$$1. \sqrt{x} = 11$$

$$x = 121$$

$$2. \frac{\sqrt{x}}{3} = 5 \cdot 3$$

$$\sqrt{x} = 15$$

$$x = 225$$

$$3. \sqrt{3x+5} = 11$$

$$\begin{array}{r} -5 \quad -5 \\ \hline \sqrt{3x} = 6 \end{array}$$

$$\frac{3x}{3} = \frac{36}{3}$$

$$x = 12$$

$$4. \frac{\sqrt{2x}}{4} = 2 \cdot 4$$

$$\sqrt{2x} = 8$$

$$\frac{2x}{2} = \frac{64}{2}$$

$$x = 32$$

$$5. \frac{\sqrt{x+5}}{3} = 4 \cdot 3$$

$$\sqrt{x+5} = 12$$

$$\begin{array}{r} x+5 = 144 \\ -5 \quad -5 \\ \hline x = 139 \end{array}$$

$$6. \frac{3\sqrt{2x}}{4} = 12 \cdot 4$$

$$\frac{3\sqrt{2x}}{3} = \frac{48}{3}$$

$$\sqrt{2x} = 16$$

$$\frac{2x}{2} = \frac{256}{2}$$

$$x = 128$$

$$7. \sqrt{-x} = \sqrt{x+128}$$

$$\begin{array}{r} -x = x+128 \\ +x \quad +x \\ \hline 0 = 2x+128 \\ -128 \quad -128 \\ \hline -128 = 2x \\ \frac{-128}{2} = \frac{2x}{2} \\ -64 = x \end{array}$$

~~$$\sqrt{4+x} = 5\sqrt{x-20}$$~~

~~$$(4+x) = \sqrt{x+4}$$~~

$$10. \frac{-3\sqrt{x}}{8} = 8$$

$$\sqrt{x} = \left(\frac{-8}{3}\right)^2$$
~~$$x = \frac{64}{9}$$~~

no solution

$$11. x = \sqrt{2x+15}$$

$$\begin{array}{r} x^2 = 2x+15 \\ -2x-15 \quad -2x-15 \\ \hline x^2-2x-15 = 0 \end{array}$$

$$(x-5)(x+3) = 0$$

$$\begin{array}{r} x-5 = 0 \quad x+3 = 0 \\ +5 \quad +5 \quad -3 \quad -3 \\ \hline x = 5 \quad x = -3 \end{array}$$

~~$$x = -3$$~~

CHECK ANSWERS!