

## Math 3 Unit 6: Radical Functions

Unit	Title	Standards
6.1	Simplifying Radical Expressions	N.RN.2, A.SSE.2
6.2	Multiplying and Dividing Radical Expressions	N.RN.2, F.IF.8
6.3	Adding & Subtracting Radical Expressions	N.RN.2, A.SSE.2
6.4	Multiplying & Dividing Binomial Radical Expressions	N.RN.2, A.SSE.2
6.5	Rational Exponents	N.RN.1, N.RN.2
6.6	Solving Radical Equations	A.REI.2
6.7	Graphing Radical Equations	F.IF.7B, F.IF.5
6.8	Graphing Radical Equations with Cubed Roots	F.IF.7B, F.IF.5
6.9	Solving and Graphing Radical Equations	A.REI.11
Unit 6 Review		

### Additional Clovis Unified Resources

<http://mathhelp.cusd.com/courses/math-3>



Clovis Unified is dedicated to helping you be successful in Math 3. On the website above you will find videos from Clovis Unified teachers on lessons, homework, and reviews. Digital copies of the worksheets, as well as hyperlinks to the videos listed on the back are also available at this site.

# Math 3 Unit 6: Online Resources

6.1	Simplifying Radical Expressions	<ul style="list-style-type: none"> <li>Khan Academy: Simplifying Radical Terms <a href="http://bit.ly/61srea">http://bit.ly/61srea</a> or <a href="http://bit.ly/61sreb">http://bit.ly/61sreb</a></li> <li>Purple Math: Square Roots &amp; More Simplification <a href="http://bit.ly/61srec">http://bit.ly/61srec</a> or <a href="http://bit.ly/61sree">http://bit.ly/61sree</a></li> <li>Patrick JMT: Radical Notation and Simplifying Radicals (Basic) <a href="http://bit.ly/61sref">http://bit.ly/61sref</a></li> </ul>
6.2	Multiplying and Dividing Radical Expressions	<ul style="list-style-type: none"> <li>Khan Academy: Rationalizing the Denominator <a href="http://bit.ly/62mdrea">http://bit.ly/62mdrea</a></li> <li>Khan Academy: Rational Expressions - Multiplying and Dividing <a href="http://bit.ly/62mdreb">http://bit.ly/62mdreb</a> or <a href="http://bit.ly/62mdrec">http://bit.ly/62mdrec</a></li> <li>Purple Math: Rationalizing Denominators <a href="http://bit.ly/62mdred">http://bit.ly/62mdred</a></li> </ul>
6.3	Adding & Subtracting Radical Expressions	<ul style="list-style-type: none"> <li>Khan Academy: Adding Radical Expressions <a href="http://bit.ly/63asreb">http://bit.ly/63asreb</a></li> <li>Khan Academy: Subtracting Radical Expressions <a href="http://bit.ly/63asrec">http://bit.ly/63asrec</a></li> <li>Purple Math: Adding and Subtracting Radical Expressions <a href="http://bit.ly/63asred">http://bit.ly/63asred</a></li> </ul>
6.4	Multiplying & Dividing Binomial Radical Expressions	<ul style="list-style-type: none"> <li>Open Algebra: Multiplying and Dividing Radical Expressions (multiple video links at the end) <a href="http://bit.ly/64mdba">http://bit.ly/64mdba</a></li> <li>Multiplying Binomial Radical Expressions <a href="http://bit.ly/64mdbb">http://bit.ly/64mdbb</a></li> </ul>
6.5	Rational Exponents	<ul style="list-style-type: none"> <li>Patrick JMT: Evaluating Numbers with Rational Exponents by using Radical Notation <a href="http://bit.ly/65raexa">http://bit.ly/65raexa</a></li> <li>Patrick JMT: Multiplying Variables with Rational Exponents – Basic Ex 1 &amp; Ex 2 <a href="http://bit.ly/65raexb">http://bit.ly/65raexb</a> or <a href="http://bit.ly/65raexc">http://bit.ly/65raexc</a></li> <li>Khan Academy: Simplifying Rational Exponents <a href="http://bit.ly/65raexd">http://bit.ly/65raexd</a></li> </ul>
6.6	Solving Radical Equations	<ul style="list-style-type: none"> <li>Patrick JMT: Solving Equations Involving Rational Exponents <a href="http://bit.ly/66srea">http://bit.ly/66srea</a></li> <li>Patrick JMT: Solving Equations Involving Square Roots <a href="http://bit.ly/66sreb">http://bit.ly/66sreb</a></li> <li>Khan Academy: Solving Square-Root Equations <a href="http://bit.ly/66srec">http://bit.ly/66srec</a></li> </ul>
6.7	Graphing Radical Equations	<ul style="list-style-type: none"> <li>Khan Academy: Graphs of Square-Root Functions <a href="http://bit.ly/67grea">http://bit.ly/67grea</a></li> <li>Khan Academy: Square-Root Functions &amp; their Graphs <a href="http://bit.ly/67greb">http://bit.ly/67greb</a></li> </ul>
6.8	Graphing Radical Equations with Cubed Roots	<ul style="list-style-type: none"> <li>Math Bits Notebook: Square-Root &amp; Cube Root Functions <a href="http://bit.ly/68grea">http://bit.ly/68grea</a></li> <li>Snap Math: Domain and Range of Cubed Root <a href="http://bit.ly/68greb">http://bit.ly/68greb</a></li> <li>Graphing Cube Root Functions <a href="http://bit.ly/68grec">http://bit.ly/68grec</a></li> </ul>
6.9	Solving and Graphing Radical Equations	<ul style="list-style-type: none"> <li>Purple Math: Graphing Radical Functions (Pages 1-3) <a href="http://bit.ly/69sgrea">http://bit.ly/69sgrea</a></li> <li>Patrick JMT: Solving an Equation Involving a Single Radical (Square Root) – Ex 1 <a href="http://bit.ly/69sgreb">http://bit.ly/69sgreb</a></li> <li>Patrick JMT: Solving an Equation Containing Two Radicals – Ex 1 <a href="http://bit.ly/69sgrec">http://bit.ly/69sgrec</a></li> </ul>

**Math 3 Unit 6 Worksheet 1**  
**Simplifying Radical Expressions**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_ Per: \_\_\_\_\_

**[1-9] Simplify.**

1.  $\sqrt{25}$

2.  $\sqrt{0.09}$

3.  $\sqrt{\frac{49}{121}}$

4.  $\sqrt[3]{27}$

5.  $\sqrt[3]{-8}$

6.  $\sqrt[3]{\frac{64}{125}}$

7.  $\sqrt{36}$

8.  $-\sqrt[3]{27}$

9.  $\sqrt{0.01}$

**[10-29] Simplify each radical expression where all variable expressions are real. Use absolute value symbols when needed.**

10.  $\sqrt{25x^2}$

11.  $\sqrt{a^6b^{12}}$

12.  $\sqrt{9c^4d^2}$

13.  $\sqrt{16x^2y^8}$

14.  $\sqrt{121x^3y^{12}}$

15.  $-3x\sqrt{81x^7y^2}$

16.  $2\sqrt{24a^4b^9}$

17.  $a\sqrt{27a^5b^6}$

18.  $3x^2\sqrt{40xy^4}$

19.  $\sqrt{75a^8b^7}$

20.  $\sqrt[3]{8x^3}$

21.  $\sqrt[3]{27x^{12}y^{15}}$

22.  $\sqrt[3]{-64x^3y^6}$

23.  $\sqrt[3]{x^{14}y^5}$

24.  $\sqrt[3]{-ab^3c^4}$

25.  $2x\sqrt[3]{-24x^3y^5}$

26.  $\sqrt[3]{32x^9y^{10}}$

27.  $\sqrt[3]{16x^4y^9}$

28.  $3x^2\sqrt[3]{-40x^8}$

29.  $\sqrt[3]{-54a^6b^{11}c^7}$

**[30-34] Find all the real solutions of each equation.**

30.  $x^2 = 36$

31.  $x^3 = 8$

32.  $x^2 = 0.81$

33.  $x^3 = -27$

34.  $x^2 = 16$

[35-36] All variable expressions are real.

35. Determine whether each expression is equivalent to  $\sqrt{32x^3y^2}$ . Select Yes or No for each expression.

	Yes	No
$2x\sqrt{8xy^2}$		
$4xy\sqrt{2x}$		
$4x y \sqrt{2x}$		
$16x\sqrt{xy^2}$		

36. Determine whether each expression is equivalent to  $\sqrt[3]{64x^6y^5}$ . Select Yes or No for each expression.

	Yes	No
$2 x \sqrt[3]{8xy^5}$		
$4x\sqrt[3]{xy^5}$		
$4x^2y^2\sqrt[3]{y^3}$		
$(2x)^2y\sqrt[3]{y^2}$		

**Math 3 Unit 6 Worksheet 2**  
**Multiplying & Dividing Radical Expressions**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_ Per: \_\_\_\_\_

[1-4] Simplify each expression, where all variable expressions are real.

1.  $\sqrt[3]{128x^5}$

2.  $\sqrt[3]{81x^7}$

3.  $\sqrt[4]{64x^6y^7}$

4.  $\sqrt[4]{32x^5}$

[5-10] Multiply and simplify, if possible.

5.  $\sqrt[3]{4} \cdot \sqrt[3]{16}$

6.  $\sqrt{5} \cdot \sqrt{50}$

7.  $\sqrt[3]{9} \cdot \sqrt[3]{9}$

8.  $\sqrt{3} \cdot \sqrt{-4}$

9.  $\sqrt[3]{-12} \cdot \sqrt[3]{-18}$

10.  $\sqrt[3]{2} \cdot \sqrt{7}$

[11-19] Multiply and simplify, if possible, where all variable expressions are real.

11.  $\sqrt{8x} \cdot \sqrt{6xy^2}$

12.  $3\sqrt[3]{16x^4y} \cdot 2\sqrt[3]{xy^2}$

13.  $x\sqrt[3]{27x^2y} \cdot 2x\sqrt[3]{x^3}$

14.  $5\sqrt{2cd^6} \cdot \sqrt{2c^3d}$

15.  $\sqrt{a^5b^5} \cdot 3\sqrt{2a^7b^6}$

16.  $\sqrt[4]{18c^9} \cdot \sqrt[4]{9cb^4}$

17.  $-\sqrt[3]{2x^3y^2} \cdot 4\sqrt[3]{12x^5y}$

18.  $\sqrt{2}(\sqrt{50} + 7)$

19.  $\sqrt{6}(\sqrt{6} + \sqrt{18})$

20. For the multiplication  $\sqrt{2xy} \cdot \sqrt{3x^3y^5}$ , where all variable expressions are real numbers, state the possible positive/negative configurations of the variables and explain the reasoning.

[21-30] Simplify each expression. Rationalize all denominators. Assume all variables represent positive numbers.

21.  $\frac{\sqrt{5}}{\sqrt{10}}$

22.  $\frac{1}{\sqrt[3]{5}}$

23.  $\frac{2}{\sqrt[3]{6}}$

24.  $\frac{1}{\sqrt[4]{8}}$

25.  $\frac{7\sqrt{3}}{4\sqrt{6a}}$

26.  $\frac{1}{\sqrt[3]{16c}}$

27.  $\frac{8}{\sqrt[3]{25x^2}}$

28.  $\frac{\sqrt{6x^4}}{\sqrt{5x^2y^5}}$

29.  $\frac{2\sqrt{7x^3y}}{-3\sqrt{12x^4y}}$

30.  $\frac{\sqrt[3]{12}}{\sqrt[3]{6x^2y}}$

[31-32] All variable expressions are real.

31. Determine whether each expression is equivalent to  $\sqrt[3]{81x^7}$ . Select Yes or No for each expression.

	Yes	No
$3\sqrt[3]{3x^7}$		
$9\sqrt[3]{x^7}$		
$3x^2\sqrt[3]{3x}$		
$3x\sqrt[3]{3x^4}$		

32. Determine whether each expression is equivalent to  $\sqrt{20x} \cdot \sqrt{10x^3y^5}$ . Select Yes or No for each expression.

	Yes	No
$2\sqrt{5x} \cdot y\sqrt{10x^3y^3}$		
$x^2\sqrt{200y^5}$		
$2y^2\sqrt{10x^4}$		
$10(xy)^2\sqrt{2y}$		

**Math 3 Unit 6 Worksheet 3**  
**Adding & Subtracting Radical Expressions**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_ Per: \_\_\_\_\_

Simplify, if possible. Assume all variables represent positive real numbers.

1.  $10\sqrt{5} + 2\sqrt{5}$

2.  $9\sqrt{2} + 5\sqrt[3]{2}$

3.  $5\sqrt{11x} - 8\sqrt{11x}$

4.  $4\sqrt{5} + 5\sqrt{7}$

5.  $9\sqrt[3]{x^2} - 4\sqrt[3]{x^2}$

6.  $3\sqrt[3]{54} - 8\sqrt[3]{54}$

7.  $5\sqrt{3} + \sqrt{12}$

8.  $11\sqrt{50} + \sqrt{8}$

9.  $\sqrt[3]{16} + \sqrt[3]{54}$

10.  $5\sqrt[3]{81} - 3\sqrt[3]{54}$

11.  $\sqrt{72} + \sqrt{18} + \sqrt{50}$

12.  $\sqrt{75} + 6\sqrt{27} - 2\sqrt{3}$

13.  $4\sqrt{18} + 6\sqrt{75} - 2\sqrt{48}$

14.  $\sqrt[3]{16} + 5\sqrt[3]{128} - 2\sqrt[3]{54}$

15.  $7\sqrt{8x} - 2\sqrt{98x}$

16.  $4\sqrt{9x} - 2\sqrt{x}$

17.  $4\sqrt{216w^2} + 3\sqrt{54w^2}$

18.  $\sqrt[3]{12x^3} + 4\sqrt{27x^3}$

19.  $\sqrt{25x^5} + 3x^2\sqrt{49x}$

20.  $x\sqrt[3]{40x^4} - \sqrt[3]{135x^7}$

21.  $x\sqrt[3]{343x} + \sqrt[3]{729x^4}$

22.  $(4 - \sqrt{6})(4 + \sqrt{6})$

23.  $(3\sqrt{7} + 5)(3\sqrt{7} - 5)$

24.  $(\sqrt{3} + \sqrt{10})(\sqrt{3} - \sqrt{10})$

25. Determine whether each expression is equivalent to  $\sqrt{50} + \sqrt{8}$ . Select Yes or No for each expression.

	Yes	No
$\sqrt{58}$		
$5\sqrt{2} + 2\sqrt{2}$		
9		
$(4 + 3)\sqrt{2}$		

26. Determine whether each expression is equivalent to  $5\sqrt{16x} - 3\sqrt{x}$ . Select Yes or No for each expression.

	Yes	No
$20\sqrt{x} - 3\sqrt{x}$		
17		
$2\sqrt{15x}$		
$17\sqrt{x}$		



**Math 3 Unit 6 Worksheet 4**  
**Multiplying & Dividing Binomial Radical Expressions**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_ Per: \_\_\_\_\_

Simplify, if possible. Assume all variables represent positive real numbers.

1.  $(3 - 6\sqrt{2})(5 - 4\sqrt{2})$

2.  $(3 + \sqrt{5})(3 - \sqrt{5})$

3.  $(2 - \sqrt{5})^2$

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

5.  $(5 + 4\sqrt{3})(1 - 2\sqrt{3})$

6.  $(9\sqrt{5} + 7)(9\sqrt{5} - 7)$

7.  $(\sqrt{3} + \sqrt{7})^2$

8.  $(2 - 4\sqrt{3})(2 + 4\sqrt{3})$

9.  $(1 + \sqrt{98})(5 + \sqrt{2})$

10.  $(3 + 2\sqrt{3})^2$

11.  $(\sqrt{7} - \sqrt{3})(\sqrt{7} + \sqrt{3})$

12.  $(\sqrt{x} - \sqrt{5})(\sqrt{x} - 6\sqrt{5})$

13.  $(\sqrt{12} + \sqrt{50})^2$

14.  $(\sqrt{1.25} - \sqrt{1.8})(\sqrt{5} - \sqrt{0.2})$

15.  $(\sqrt{x+2} - \sqrt{x-2})(\sqrt{x+2} + \sqrt{x-2})$

16.  $\frac{5}{1 + \sqrt{2}}$

17.  $\frac{9}{\sqrt{5} - 3}$

18.  $\frac{\sqrt{3}}{8 + \sqrt{7}}$

19.  $\frac{6}{4 - \sqrt{10}}$

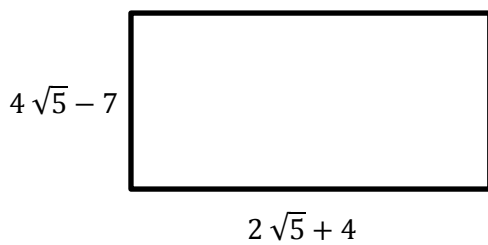
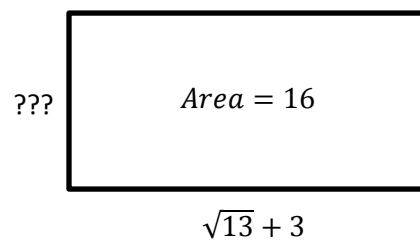
20.  $\frac{12}{\sqrt{23} - 9}$

21.  $\frac{\sqrt{49}}{\sqrt{9} + \sqrt{16}}$

22.  $\frac{2 + \sqrt{8}}{3\sqrt{8} - 2}$

23.  $\frac{2 + 3\sqrt{27}}{9 - \sqrt{27}}$

24. Find the perimeter and area of the rectangle

25. Find the unknown side and **verify the area**

**Math 3 Unit 6 Worksheet 5**  
**Rational Exponents**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_ Per: \_\_\_\_\_

**[1-14] Simplify each expression.**

1.  $81^{\frac{1}{2}}$

2.  $125^{\frac{2}{3}}$

3.  $16^{-\frac{1}{4}}$

4.  $9^{-\frac{3}{2}}$

5.  $3^{\frac{1}{2}} \cdot 3^{\frac{1}{2}}$

6.  $(-8)^{\frac{1}{3}} \cdot (-8)^{\frac{1}{3}}$

7.  $(-32)^{0.8}$

8.  $243^{1.25}$

9.  $100^{-1.5}$

10.  $\frac{16^{\frac{1}{2}}}{16^{\frac{1}{4}}}$

11.  $\frac{1000^{\frac{2}{3}}}{100^{\frac{1}{2}}}$

12.  $\frac{64^{\frac{1}{3}}}{8^{\frac{1}{3}}}$

13.  $(27^{-\frac{2}{3}})^{-1}$

14.  $(25^{\frac{3}{2}})^{\frac{1}{3}}$

**[15-19] Write each expression in radical form.**

15.  $x^{\frac{1}{2}}$

16.  $x^{\frac{2}{3}}$

17.  $y^{1.25}$

18.  $y^{-\frac{2}{3}}$

19.  $y^{-\frac{3}{4}}$

**[20- 24] Write each expression in exponential form.**

20.  $\sqrt{6}$

21.  $-\sqrt[3]{y^2}$

22.  $(\sqrt[4]{y})^3$

23.  $(\sqrt[3]{2xy})^6$

24.  $\sqrt{7x}$

[25-39] Write each expression in simplest form. Assume all variables represent positive real numbers.

$$25. (27x^9)^{\frac{1}{3}}$$

$$26. (81x^{12})^{-\frac{1}{4}}$$

$$27. (125x^6 y^{\frac{1}{2}})^{\frac{2}{3}}$$

$$28. (32x^{10} y^{\frac{1}{2}})^{\frac{2}{5}}$$

$$29. (8x^{\frac{3}{4}} y^6)^{\frac{4}{3}}$$

$$30. x^{\frac{2}{3}} \cdot x^{\frac{1}{3}}$$

$$31. y^{\frac{1}{2}} \cdot 2y^{\frac{1}{4}}$$

$$32. 4x^{\frac{2}{5}} \cdot 3x^{\frac{3}{10}}$$

$$33. x^{\frac{3}{4}} \div x^{\frac{1}{8}}$$

$$34. \frac{x^{\frac{1}{2}} y^{-\frac{1}{2}}}{x^{\frac{1}{4}} y^{-\frac{3}{2}}}$$

$$35. \left( \frac{x^{\frac{1}{2}}}{y^{-\frac{3}{4}}} \right)^8$$

$$36. \left( \frac{27x^9}{8y^{12}} \right)^{\frac{1}{3}}$$

$$37. \left( \frac{18x^{12}}{2y^4} \right)^{\frac{1}{2}}$$

$$38. \left( \frac{2x^6}{128y^{15}} \right)^{\frac{2}{3}}$$

$$39. \left( \frac{27x^4}{48y^2} \right)^{\frac{3}{2}}$$

**Math 3 Unit 6 Worksheet 6**  
**Solving Radical Equations**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_ Per: \_\_\_\_\_

[1-8] Solve the following for  $x$ .

1.  $4\sqrt{x} + 3 = 15$

2.  $\sqrt{2x + 3} - 5 = 0$

3.  $5x^{\frac{2}{3}} = 45$

4.  $f(g(x)) = 16$

If  $f(x) = 2x^{\frac{3}{4}}$  and  $g(x) = x - 2$

5.  $f(g(x)) = 27$

If  $f(x) = x^{\frac{3}{2}}$  and  $g(x) = x - 1$

6.  $f(g(x)) = 2$

If  $f(x) = x^{\frac{1}{3}}$  and  $g(x) = x + 1$

7.  $(x + 4)^{\frac{3}{4}} - 6 = 21$

8.  $2x^{\frac{1}{2}} + 4 = 6$

[9-20] Solve the following for  $x$ . Check for extraneous solutions.

9.  $\sqrt{x + 3} = x + 1$

10.  $\sqrt{2x} = \sqrt{x + 5}$

11.  $x - 6 = \sqrt{3x}$

12.  $f(x) - g(x) = 0$   
If  $f(x) = \sqrt{5 - 4x}$  and  $g(x) = x$

13.  $\sqrt{5 - 4x} = -3$

14.  $\sqrt{4 - 11x} = -x + 2$

15.  $f(x) - g(x) = 0$   
If  $f(x) = \sqrt{1 - x}$  and  $g(x) = x + 1$

16.  $\sqrt{x + 2} + 4 = x$

17.  $\sqrt{x^2 + 3} = x + 1$

18.  $\sqrt{x} - \sqrt{x - 5} = 2$

19.  $\sqrt{x + 9} = 1 + \sqrt{2 + x}$

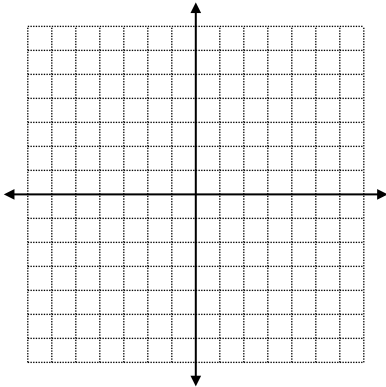
20.  $\sqrt{x} = \sqrt{x - 8} + 2$

**Math 3 Unit 6 Worksheet 7**  
**Graphing Radical Equations**

Name: \_\_\_\_\_  
 Date: \_\_\_\_\_ Per: \_\_\_\_\_

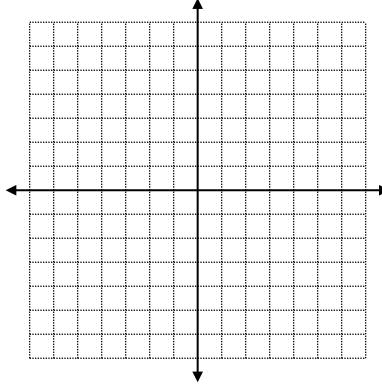
[1-6] Graph each function and state the domain and range.

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



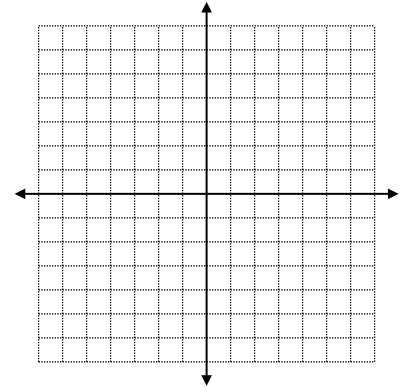
Domain \_\_\_\_\_  
 Range \_\_\_\_\_

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



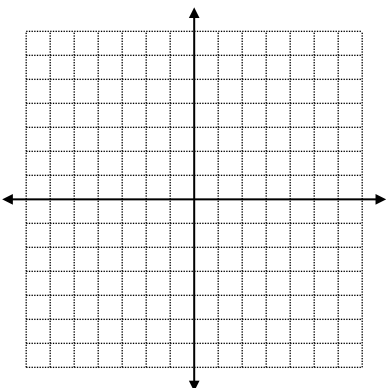
Domain \_\_\_\_\_  
 Range \_\_\_\_\_

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



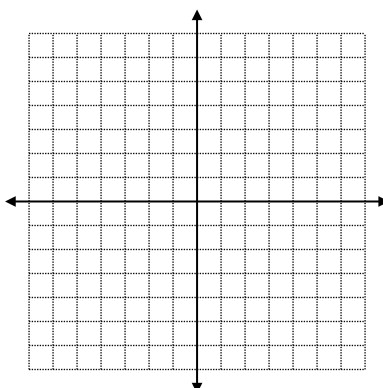
Domain \_\_\_\_\_  
 Range \_\_\_\_\_

4.  $y = 3\sqrt{x+1} - 6$



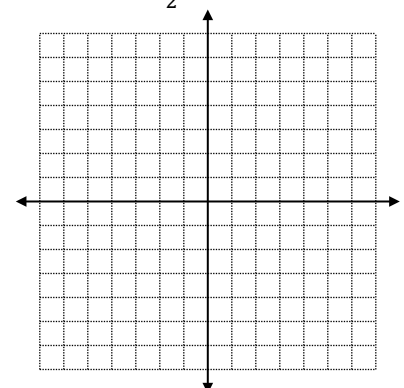
Domain \_\_\_\_\_  
 Range \_\_\_\_\_

5.  $y = -2\sqrt{x-2} + 1$



Domain \_\_\_\_\_  
 Range \_\_\_\_\_

6.  $y = \frac{1}{2}\sqrt{x+2} + 3$



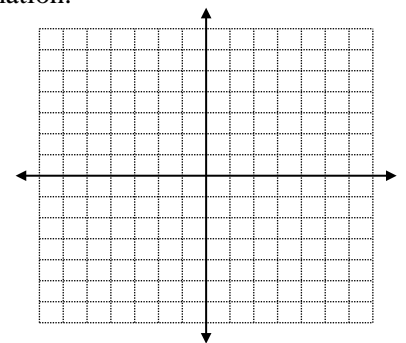
Domain \_\_\_\_\_  
 Range \_\_\_\_\_

[7-11]: Sketch the graph for each of the following and find/solve for the indicated information.

7.  $f(x) = \sqrt{x} + 4$

- a) Domain & Range
- b)  $x$  - and  $y$  - intercept(s)

- c) The open interval where  $f$  is increasing
- d) The average rate of change for  $f$  on  $0 \leq x \leq 9$



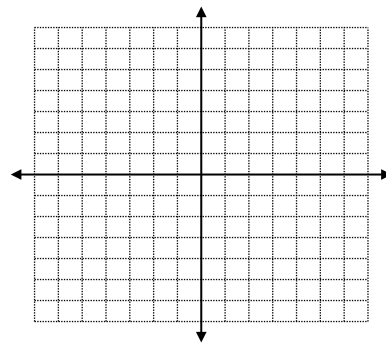
8.  $g(x) = 5 - \sqrt{x}$

a) Domain & Range

b)  $x$  - and  $y$  - intercept(s)

c) The open interval where  $g$  is decreasing

d) The open interval where  $g$  is negative



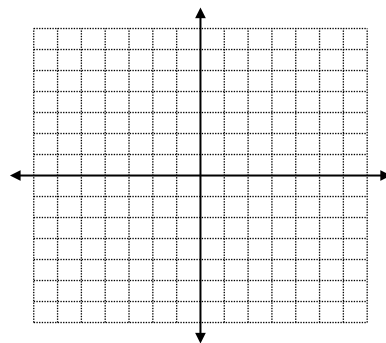
9.  $h(x) = \sqrt{x+2} - 3$

a) Domain & Range

b)  $x$  - and  $y$  - intercept(s)

c) The open interval where  $h$  is positive

d) The average rate of change for  $h$  on  $-1 \leq x \leq 7$



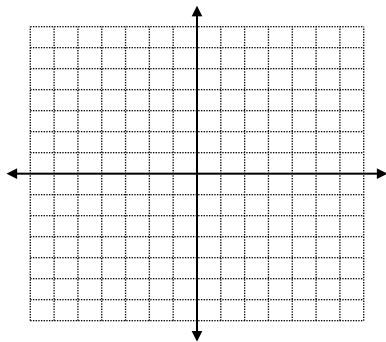
10.  $y = \frac{1}{2} \sqrt{x+1} - 2$

a) Domain & Range

b)  $x$  - and  $y$  - intercept(s)

c) The open interval where the function is increasing

d) The average rate of change for this function from  $x = 3$  to  $x = 15$



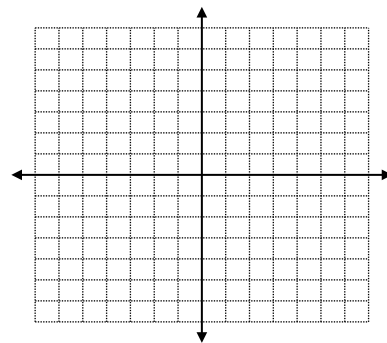
11.  $f(x) = 3 - 2\sqrt{x+4}$

a) Domain & Range

b)  $x$  - and  $y$  - intercept(s)

c) The average rate of change for  $f$  from  $x = -3$  to  $x = 5$

d) The open interval where  $f$  is positive



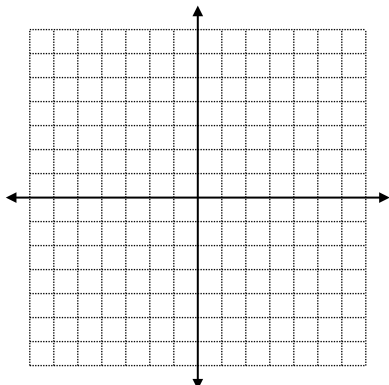


**Math 3 Unit 6 Worksheet 8**  
**Graphing Radical Equations with Cubed Roots**

Name: \_\_\_\_\_  
 Date: \_\_\_\_\_ Per: \_\_\_\_\_

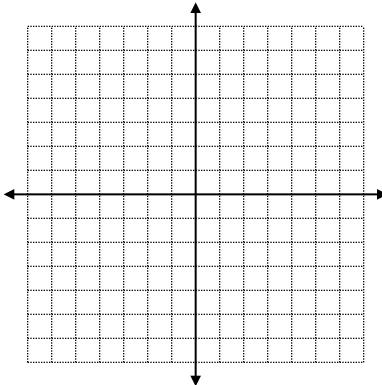
[1-6] Graph each function and state the domain and range.

1.  $y = \sqrt[3]{x} + 2$



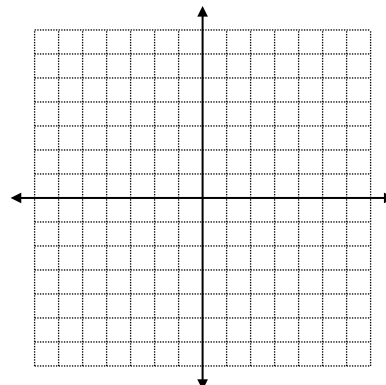
Domain \_\_\_\_\_  
 Range \_\_\_\_\_

2.  $y = \sqrt[3]{x - 3}$



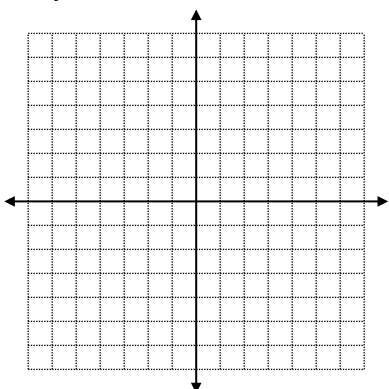
Domain \_\_\_\_\_  
 Range \_\_\_\_\_

3.  $y = -\sqrt[3]{x} - 1$



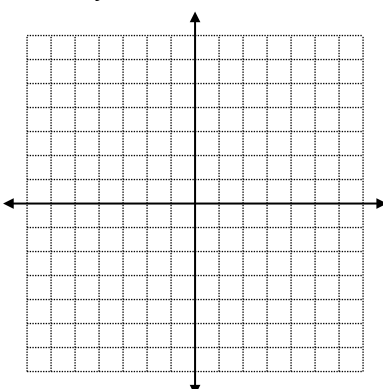
Domain \_\_\_\_\_  
 Range \_\_\_\_\_

4.  $y = 2\sqrt[3]{x + 1} - 4$



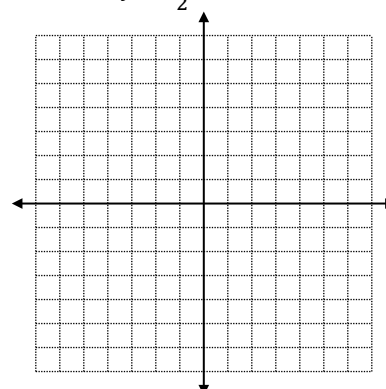
Domain \_\_\_\_\_  
 Range \_\_\_\_\_

5.  $y = -2\sqrt[3]{x - 2} + 1$



Domain \_\_\_\_\_  
 Range \_\_\_\_\_

6.  $y = \frac{1}{2}\sqrt[3]{x + 2} + 3$



Domain \_\_\_\_\_  
 Range \_\_\_\_\_

[7-8]: Sketch the graph for each of the following and find/solve for the indicated information.

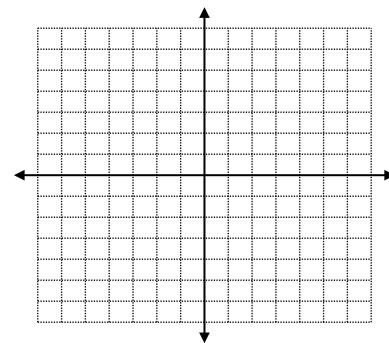
7.  $g(x) = 1 - \sqrt[3]{x + 2}$

a) Domain & Range

b)  $x$  - and  $y$  - intercept(s)

c) The open interval where  $g$  is decreasing

d) The open interval where  $g$  is negative



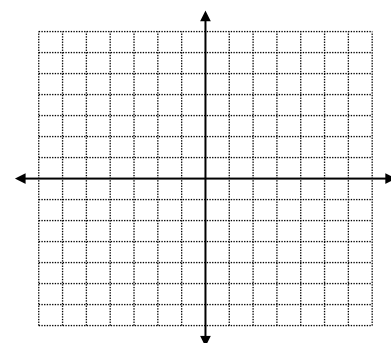
8.  $h(x) = 2\sqrt[3]{x - 3} + 2$

a) Domain & Range

b)  $x$  - and  $y$  - intercept(s)

c) The open interval where  $h$  is negative

d) The average rate of change for  $h$  on  $-5 \leq x \leq 2$



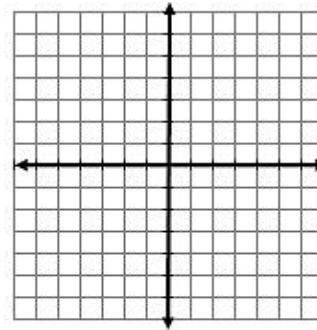
**Math 3 Unit 6 Worksheet 9**  
**Solving and Graphing Radical Equations**

Name: \_\_\_\_\_  
 Date: \_\_\_\_\_ Per: \_\_\_\_\_

1. a) Solve algebraically for  $x$ :  $\sqrt{x+1} = x-1$

b) Accurately graph the system of equations which is from the algebraic equation in part a).

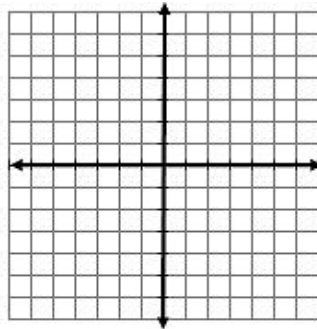
$f(x) = \sqrt{x+1}$  and  $g(x) = x-1$



$f(x) = g(x)$  at  $x = \underline{\hspace{2cm}}$

2. a) Solve algebraically for  $x$ :  $-\sqrt{x+7} = -x-1$

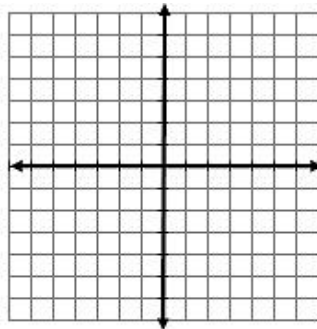
b) Rewrite the algebraic equation into a system of equations and accurately graph.



$f(x) = g(x)$  at  $x = \underline{\hspace{2cm}}$

3. a) Solve algebraically for  $x$ :  $\sqrt{x+3} = 2x$

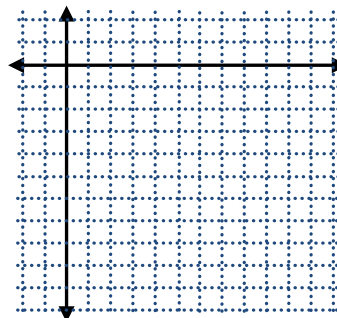
b) Rewrite the algebraic equation into a system of equations and accurately graph.



$f(x) = g(x)$  at  $x = \underline{\hspace{2cm}}$

4. a) Solve algebraically for  $x$ :  $-\sqrt{x-4} = x-10$

b) Rewrite the algebraic equation into a system of equations and accurately graph.



$f(x) = g(x)$  at  $x = \underline{\hspace{2cm}}$

[5-19] Solve the following for  $x$ . Check for extraneous solutions.

5.  $\frac{1}{3}\sqrt{x+5} - 2 = 2$

6.  $17 - 3\sqrt{x-4} = 2$

7.  $f(g(x)) = 15$

If  $f(x) = \sqrt{x}$  and  $g(x) = x + 2$

8.  $4\sqrt[3]{x+3} + 17 = 9$

9.  $2f(x) + 19 = 3$

If  $f(x) = \sqrt{x+1}$

10.  $\sqrt{8x+9} = 3\sqrt{x}$

11.  $\sqrt{10x+8} = 2\sqrt{3x}$

12.  $3\sqrt{5x+3} = 6\sqrt{2x}$

13.  $2\sqrt{x} = \sqrt{3x+6}$

14.  $f(g(x)) = g(x) - 2$

If  $g(x) = x + 2$  and  $f(x) = \sqrt{x}$

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

16.  $\sqrt{2x+5} = x + 1$

17.  $3x - 5\sqrt{x} = 2$

18.  $\sqrt{2x+5} = 2\sqrt{2x} + 1$

19.  $\sqrt{x+7} = x - 5$

**Math 3 Unit 6 Review Worksheet 1**  
**Radical Functions**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_ Per: \_\_\_\_\_

[1-23] Simplify the following:

1.  $\sqrt{49m^2}$

2.  $\sqrt{27m^4}$

3.  $\sqrt{121m^6n^8}$

4.  $\sqrt[3]{-27}$

5.  $\sqrt[3]{8m^3}$

6.  $\sqrt[5]{-32}$

7.  $\sqrt{80m^4n^5}$

8.  $\sqrt{147m^3n^4}$

9.  $\frac{18}{\sqrt{13+2}}$

10.  $\frac{1}{\sqrt[3]{4}}$

11.  $\frac{5}{\sqrt[3]{25x^2}}$

12.  $\frac{\sqrt{20x^4y^2}}{\sqrt{5xy^3}}$

13.  $\frac{3x}{\sqrt{7x}}$

14.  $\frac{-3}{\sqrt{7}-5}$

15.  $\frac{2}{\sqrt{3}+1}$

16.  $\sqrt{8x^3} + 3x\sqrt{2x}$

17.  $(64x^9y^3)^{\frac{1}{3}}$

18.  $(81x^{12})^{-\frac{1}{4}}$

19.  $3x^{\frac{1}{2}} \cdot 4x^{\frac{2}{3}}$

20.  $2x^{\frac{5}{4}} \div 6x^{\frac{1}{2}}$

21.  $7\sqrt{2x^3y^6} \cdot \sqrt{2xy}$

22.  $\sqrt{27x^2y} \cdot \sqrt{x^3y^5}$

23.  $4m\sqrt{75mn^6} - 2n^2\sqrt{48m^3n^2}$

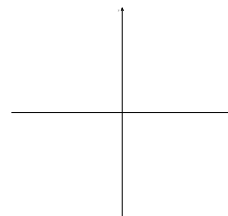
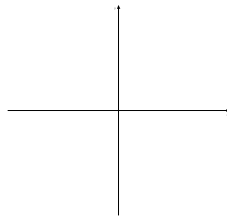
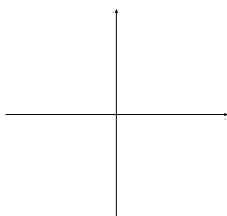
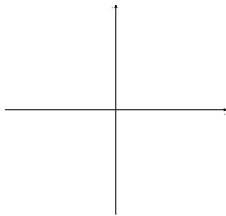
24. Rewrite the functions below so they are translated 5 units left and 7 units up. Sketch the translated function.

a)  $y = x^2$

b)  $y = (x - 2)^2 + 3$

c)  $y = |x|$

d)  $y = |x + 2| + 1$

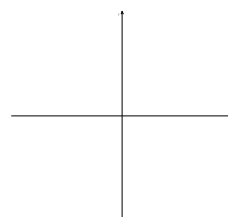
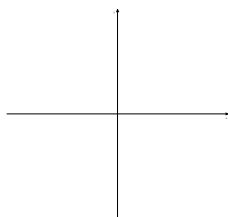
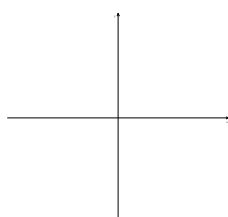
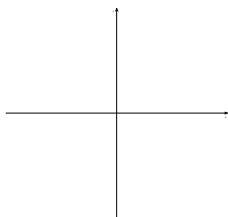


e)  $y = \sqrt{x}$

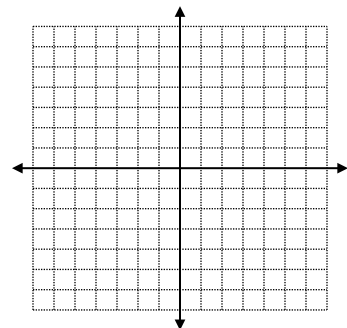
f)  $y = \sqrt{x + 1} - 2$

g)  $y = \sqrt[3]{x}$

h)  $y = \sqrt[3]{x - 1} - 1$

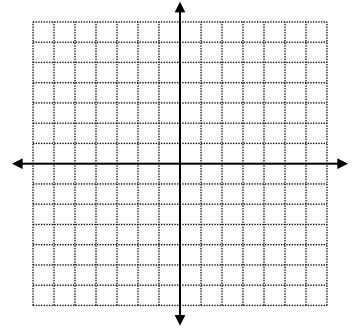


25. Given:  $f(x) = (x - 2)^2 + 5$ ,  $x \geq 2$ . Sketch  $f(x)$  and identify its domain and range.



26. Given:  $f(x) = \sqrt{x}$  and  $g(x) = x - 3$

Sketch  $y = -f(g(x))$  and identify its domain and range.



[27-29] Solve the following equation for  $x$ :

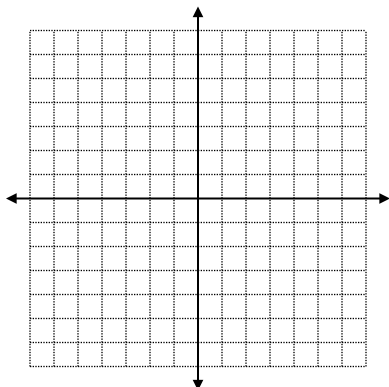
27.  $\frac{1}{4}\sqrt{x+3} - 1 = 0$

28.  $\sqrt{2x+10} = \sqrt{4x}$

29.  $\sqrt{2x^2+16} = 2\sqrt{3x}$

30. a) Solve the following equation algebraically for  $x$ :  $\sqrt{x-2} = x-4$

b) Rewrite the above equation as a system of two equations and graph.



$f(x) =$  \_\_\_\_\_

$g(x) =$  \_\_\_\_\_

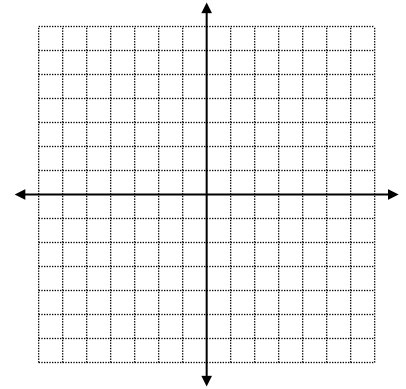
For  $f(x) = g(x)$ ,  $x =$  \_\_\_\_\_

[31-33] Graph the following and find the following:

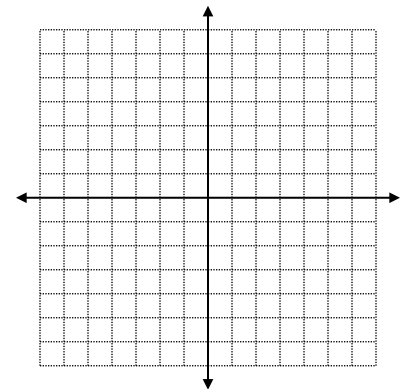
- a)  $x$ -intercept and  $y$ -intercept
- c) the open interval where  $f$  is increasing
- e) the open interval where  $f$  is negative
- g) Average rate of change on the specified interval
  - $[3, 7]$  for problem #31
  - $[-2, 1]$  for problem #32
  - $[-4, 4]$  for problem #33

- b) Domain and Range
- d) the open interval where  $f$  is decreasing
- f) the open interval where  $f$  is positive

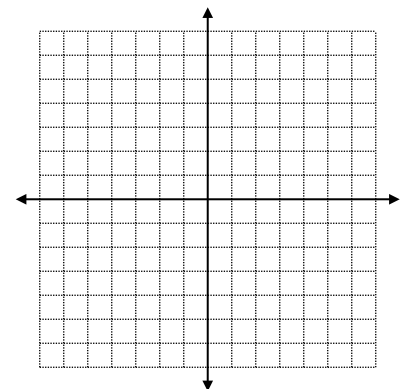
31.  $f(x) = \frac{1}{2} \sqrt{x-3} - 1$



32.  $f(x) = 4 - \sqrt{x+3}$



33.  $f(x) = \frac{1}{2} \sqrt[3]{x+4} - 1$





34. Determine whether each expression is equivalent to  $\sqrt{32x^3y^2}$ . Select Yes or No for each expression.

	Yes	No
$4x\sqrt{2xy^2}$		
$2^2xy\sqrt{2x}$		
$4x y \sqrt{2x}$		
$2x\sqrt{2xy^2}$		
$2x y \sqrt{8x}$		

[35-39]: Matching.

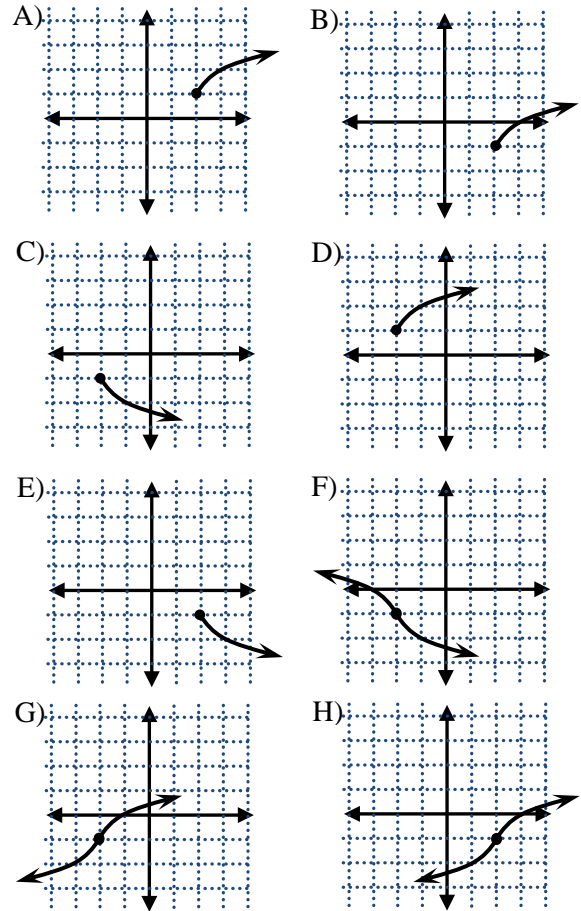
35.  $y = \sqrt{x-2} - 1$

36.  $y = -\sqrt{x-2} - 1$

37.  $y = \sqrt[3]{x-2} - 1$

38.  $y = -\sqrt{x+2} - 1$

39.  $y = -\sqrt[3]{x+2} - 1$



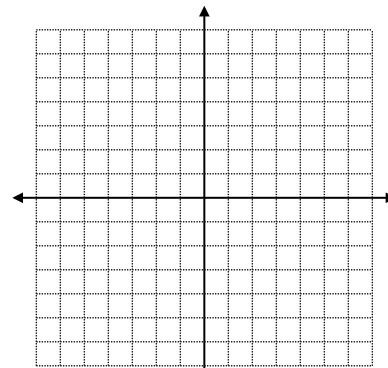
[40-42]: Solve for  $x$ .

40.  $75 - 4\sqrt{x-5} = 39$

41.  $3\sqrt{5x+4} = 6\sqrt{2x}$

42.  $\sqrt{x+3} = -x-1$

43. Go back to problem #42. Rewrite the equation as a system of two equations and graph both on the coordinate axes to the right. Find the solution(s) to the system based on the graph.



44. Given  $f(x) = 2\sqrt{x+5} - 4$

a) Sketch.

b) Identify domain & range.

c) Find  $x$ -int &  $y$ -int.

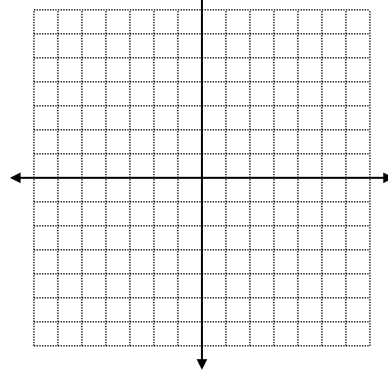
d) Identify open interval where  $f$  is increasing.

e) Identify open interval where  $f$  is decreasing.

f) Identify open interval where  $f$  is positive.

g) Identify open interval where  $f$  is negative.

h) Find the average rate of change for  $f$  on  $-4 \leq x \leq 11$ .



45. If  $f(x) = -\sqrt{x-2} - 7$ , find its domain & range.

**Math 3 Unit 6 Review Worksheet 2**  
**Radical Functions**

Name: \_\_\_\_\_  
Date: \_\_\_\_\_ Per: \_\_\_\_\_

**[1-6] Selected Response: Choose all answers that apply**

1. Choose which of the following expression(s) is equivalent to  $\sqrt{81x^3y^2}$  1. \_\_\_\_\_  
{Hint: There are two correct responses }

- A)  $3x|y|\sqrt{x}$       B)  $3^2x\sqrt{xy^2}$       C)  $9y\sqrt{x^3}$       D)  $9x|y|\sqrt{x}$       E)  $9xy\sqrt{x}$

2. Choose which of the following expression(s) is equivalent to  $\sqrt{16}$  2. \_\_\_\_\_  
{Hint: There are three correct responses }

- A)  $-8$       B)  $8$       C)  $(-2)^2$       D)  $2^2$       E)  $4$

3. Choose which of the following expression(s) is equivalent to  $4x\sqrt{12x}$  3. \_\_\_\_\_  
{Hint: There are three correct responses }

- A)  $8x\sqrt{3x}$       B)  $24\sqrt{x^3}$       C)  $6x\sqrt{3x} + 2x\sqrt{3x}$       D)  $8\sqrt{3x^3}$       E)  $12x\sqrt{2x}$

4. Choose which of the following expression(s) is equivalent to  $\sqrt[3]{-8x^3y^6}$  4. \_\_\_\_\_  
{Hint: There are two correct responses }

- A)  $2|x|y^2$       B)  $-2|x|y^2$       C)  $2xy^3$       D)  $-2xy^2$       E)  $-\frac{4}{2}xy^2$

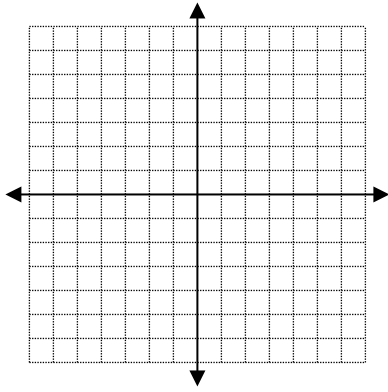
5. Choose which of the following expression(s) is equivalent to  $\sqrt{8x} + \sqrt{2x}$  5. \_\_\_\_\_  
{Sorry, no hints this time. }

- A)  $3\sqrt{2x}$       B)  $2\sqrt{2x} + \sqrt{2x}$       C)  $\sqrt{10x}$       D)  $\sqrt{10x^2}$       E)  $|x|\sqrt{10}$

6. Choose which of the following expression(s) is equivalent to  $(4 - \sqrt{2})(2 + \sqrt{2})$  6. \_\_\_\_\_  
{Sorry, no hints this time. }

- A)  $8 + 4\sqrt{2} - 2\sqrt{2} - 2$       B)  $6$       C)  $8 + \sqrt{8} - \sqrt{4} - \sqrt{4}$       D)  $2(3 + \sqrt{2})$       E)  $6 + 2\sqrt{2}$

7. Graph:  $f(x) = -\sqrt{x+5} + 3$



A. Sketch the graph

B. Domain: \_\_\_\_\_ Range \_\_\_\_\_

C. Identify the  $x$ -intercept: \_\_\_\_\_ show work

D. Identify the  $y$ -intercept: \_\_\_\_\_

E. Open interval where  $f$  is increasing \_\_\_\_\_

F. Open interval where  $f$  is positive \_\_\_\_\_

G. Identify the rate of change over  $-4 \leq x \leq 4$  \_\_\_\_\_ show work

H. Rewrite  $f$  if it were shifted 7 units to the left and 2 units down  $f(x) =$  \_\_\_\_\_

Original Vertex:

Shift:

New Vertex:

8. Rationalize:  $\frac{20}{7\sqrt{3}}$

9. Rationalize:  $\frac{3}{7-\sqrt{2}}$

8. \_\_\_\_\_

9. \_\_\_\_\_

10. Simplify:  $2\sqrt{10ab} \cdot 6\sqrt{14ab^2}$

11. Rationalize:  $\frac{8\sqrt[3]{7}}{2\sqrt[3]{25}}$

10. \_\_\_\_\_

11. \_\_\_\_\_

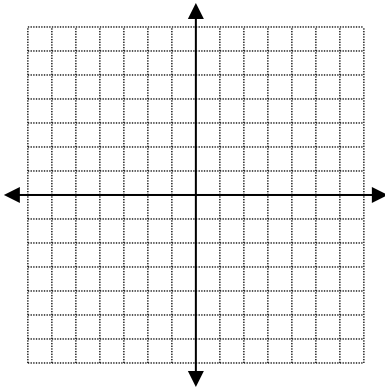
12. Simplify:  $5a \sqrt[3]{80a^3} + 3a^2 \sqrt[3]{10}$

12. \_\_\_\_\_

13. Simplify:  $\frac{3a^5 \sqrt{8x^7}}{a \sqrt{6x^8}}$

13. \_\_\_\_\_

14. Cube root graphing:



A. Graph  $f(x) = -\sqrt[3]{x+3} - 5$

B. Domain \_\_\_\_\_ Range \_\_\_\_\_

C. This function is: *always increasing / always decreasing / at times increasing and at times decreasing*

(Circle the correct answer)

D. Identify the  $x$ -intercept: \_\_\_\_\_ show work

E. Identify the  $y$ -intercept: \_\_\_\_\_

F. Open interval where  $f$  is positive \_\_\_\_\_ G. Open interval where  $f$  is negative \_\_\_\_\_

15. Multiply:  $(2 + 3\sqrt{5})(5 - 2\sqrt{5})$

16. Simplify:  $(8 - 3\sqrt{2})^2$

15. \_\_\_\_\_

16. \_\_\_\_\_

### Math 3 Unit 6 Selected Answers

Selected Answers to Math 3 Unit 6 Worksheet #1:

1. 5 3.  $\frac{7}{11}$  5.  $-2$  7. 6 9. 0.1 11.  $|a^3|b^6$  13.  $4|x|y^4$  15.  $-27x^4|y|\sqrt{x}$  17.  $3a^3|b^3|\sqrt{3a}$   
19.  $5a^4b^3\sqrt{3b}$  21.  $3x^4y^5$  23.  $x^4y\sqrt[3]{x^2y^2}$  25.  $-4x^2y\sqrt[3]{3y^2}$  27.  $2xy^3\sqrt[3]{2x}$  29.  $-3a^2b^3c^2\sqrt[3]{2b^2c}$   
31.  $x = 2$  33.  $x = -3$

Selected Answers to Math 3 Unit 6 Worksheet #2:

1.  $4x\sqrt[3]{2x^2}$  3.  $2|x|y\sqrt[4]{4x^2y^3}$  5. 4 7.  $3\sqrt[3]{3}$  9. 6 11.  $4x|y|\sqrt{3}$  13.  $6x^3\sqrt[3]{x^2y}$  15.  $3a^6|b^5|\sqrt{2b}$   
17.  $-8x^2y\sqrt[3]{3x^2}$  19.  $6 + 6\sqrt{3}$  21.  $\frac{\sqrt{2}}{2}$  23.  $\frac{\sqrt[3]{36}}{3}$  25.  $\frac{7\sqrt{2a}}{8a}$  27.  $\frac{8\sqrt[3]{5x}}{5x}$  29.  $-\frac{\sqrt{21x}}{9x}$

Selected Answers to Math 3 Unit 6 Worksheet #3:

1.  $12\sqrt{5}$  3.  $-3\sqrt{11x}$  5.  $5\sqrt[3]{x^2}$  7.  $7\sqrt{3}$  9.  $5\sqrt[3]{2}$  11.  $14\sqrt{2}$  13.  $12\sqrt{2} + 22\sqrt{3}$  15. 0 17.  $33w\sqrt{6}$   
19.  $26x^2\sqrt{x}$  21.  $16x\sqrt[3]{x}$  23. 38

Selected Answers to Math 3 Unit 6 Worksheet #4:

1.  $63 - 42\sqrt{2}$  3.  $9 - 4\sqrt{5}$  5.  $-19 - 6\sqrt{3}$  7.  $10 + 2\sqrt{21}$  9.  $19 + 36\sqrt{2}$  11. 4 13.  $62 + 20\sqrt{6}$  15. 4  
17.  $\frac{9\sqrt{5}+27}{-4}$  19.  $4 + \sqrt{10}$  21. 1 23.  $\frac{33+29\sqrt{3}}{18}$  25.  $?? = 4\sqrt{13} - 12$

Selected Answers to Math 3 Unit 6 Worksheet #5:

1. 9 3.  $\frac{1}{2}$  5. 3 7. 16 9.  $\frac{1}{1000}$  11. 10 13. 9 15.  $\sqrt{x}$  17.  $\sqrt[4]{y^5}$  19.  $\frac{1}{\sqrt[4]{y^3}}$  21.  $-y^{\frac{2}{3}}$  23.  $(2xy)^2$  25.  $3x^3$  27.  $25x^4y^{\frac{1}{3}}$   
29.  $16xy^8$  31.  $2y^{\frac{3}{4}}$  33.  $x^{\frac{5}{8}}$  35.  $x^4y^6$  37.  $\frac{3x^6}{y^2}$  39.  $\frac{27x^6}{64y^3}$

Selected Answers to Math 3 Unit 6 Worksheet #6:

1.  $x = 9$  3.  $x = \pm 27$  5.  $x = 10$  7.  $x = 77$  9.  $x = 1$  11.  $x = 12$  13.  $\emptyset$  15.  $x = 0$  17.  $x = 1$  19.  $x = 7$

Selected Answers to Math 3 Unit 6 Worksheet #7:

- 7 a)  $D: x \geq 0$  or  $[0, \infty)$ ;  $R: y \geq 4$  or  $[4, \infty)$  b)  $(0, 4)$  c)  $x \geq 0$  or  $(0, \infty)$  d)  $1/3$   
9 a)  $D: x \geq -2$  or  $[-2, \infty)$ ;  $R: y \geq -3$  or  $[-3, \infty)$  b)  $(7, 0)$  and  $(0, \sqrt{2} - 3) \approx (0, -1.586)$  c)  $x > 7$  or  $(7, \infty)$  d)  $1/4$   
11 a)  $D: x \geq -4$  or  $[-4, \infty)$ ;  $R: y \leq -3$  or  $(-\infty, -3]$  b)  $(-7/4, 0)$  and  $(0, -1)$  c)  $-1/2$  d)  $-4 < x < -7/4$  or  $(-4, -7/4)$

Selected Answers to Math 3 Unit 6 Worksheet #8:

- 7 a)  $D$  &  $R$ : all reals or  $(-\infty, \infty)$  b)  $(-1, 0)$ ;  $(0, 1 - \sqrt[3]{2}) \approx (0, -0.260)$  c) all reals or  $(-\infty, \infty)$  d)  $x > -1$  or  $(-1, \infty)$   
8 a)  $D$  &  $R$ : all reals or  $(-\infty, \infty)$  b)  $(2, 0)$  and  $(0, 2 - 2\sqrt[3]{3}) \approx (0, -0.884)$  c)  $x < 2$  or  $(-\infty, 2)$  d)  $\frac{2}{7}$

Selected Answers to Math 3 Unit 6 Worksheet #9:

1.  $\{3\}$ ; 0 is an extraneous root 3.  $\{1\}$ ;  $-\frac{3}{4}$  is an extraneous root 5.  $\{139\}$  7.  $\{223\}$  9.  $\emptyset$  11.  $\{4\}$  13.  $\{6\}$  15.  $\{3 \text{ only}\}$  17.  $\{4 \text{ only}\}$  19.  $\{9 \text{ only}\}$

### Math 3 Unit 6 Selected Answers

Selected Answers to Math 3 Unit 6 Review WS 1:

1.  $7|m|$  3.  $11|m^3|n^4$  5.  $2m$  7.  $4m^2n^2\sqrt{5n}$  9.  $-4 + 2\sqrt{13}$  11.  $\frac{\sqrt[3]{5x}}{x}$  13.  $\frac{\sqrt[3]{7x}}{7}$  15.  $-1 + \sqrt{3}$  17.  $4x^3y$  19.  $12x^{\frac{7}{6}}$   
21.  $14x^2y^3\sqrt{y}$  23.  $12m|n^3|\sqrt{3m}$  25.  $D = [-\infty, \infty) \& R = [5, \infty)$  27.  $\{13\}$  29.  $\{2,4\}$  31. a.  $(7, 0)$  b.  $D = [3, \infty) \& R = [-1, \infty)$  c.  $(3, \infty)$  d. none e.  $(3, 7)$  f.  $(7, \infty)$  g. *Avg rate of change on  $[3, 7] = 1/4$*  33a.  $(4, 0)$  and  $(0, -1 + \frac{1}{2}\sqrt[3]{4})$  b.  $D \& R = (-\infty, \infty)$  c.  $(-\infty, \infty)$  d. none e.  $(-\infty, 4)$  f.  $(4, \infty)$   
g. *Avg rate of change on  $[-4, 4] = \frac{1}{8}$*  35. B 37. H 39. F 41.  $\{\frac{4}{3}\}$  45.  $D = [2, \infty) \& R = (-\infty, -7]$

Selected Answers to Math 3 Unit 6 Review WS 2:

1. BD 2. CDE 3. ACD 4. DE 5. AB 6. ADE 7. b.  $D = [-5, \infty) \& R = [-\infty, 3)$   
c.  $x - int = (4,0)$  d.  $y - int = (0, -\sqrt{5} + 3)$  e. none f.  $(-5,4)$  g. *Avg rate of change on  $[-4, 44] = -\frac{1}{8}$*   
h.  $f(x) = -\sqrt{x+12} + 1$  9.  $\frac{21+3\sqrt{2}}{47}$  11.  $\frac{4\sqrt[3]{35}}{5}$  13.  $\frac{2a^4\sqrt{3x}}{x}$  15.  $-20 + 11\sqrt{5}$