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	• Khan Academy: Simplifying Radical Terms http://bit.ly/61srea or http://bit.ly/61sreb • Purple Math: Square Roots & More Simplification http://bit.ly/61srec or http://bit.ly/61sree • Patrick JMT: Radical Notation and Simplifying Radicals (Basic) http://bit.ly/61sref
6.2	Multiplying and Dividing Radical Expressions	• Khan Academy: Rationalizing the Denominator http://bit.ly/62mdrea • Khan Academy: Rational Expressions - Multiplying and Dividing http://bit.ly/62mdreb or http://bit.ly/62mdrec • Purple Math: Rationalizing Denominators http://bit.ly/62mdred
6.3	Adding & Subtracting Radical Expressions	• Khan Academy: Adding Radical Expressions http://bit.ly/63asreb • Khan Academy: Subtracting Radical Expressions http://bit.ly/63asrec • Purple Math: Adding and Subtracting Radical Expressions http://bit.ly/63asred
6.4	Multiplying & Dividing Binomial Radical Expressions	• Open Algebra: Multiplying and Dividing Radical Expressions (multiple video links at the end) http://bit.ly/64mdba • Multiplying Binomial Radical Expressions http://bit.ly/64mdbb
6.5	Rational Exponents	• Patrick JMT: Evaluating Numbers with Rational Exponents by using Radical Notation http://bit.ly/65raexa • Patrick JMT: Multiplying Variables with Rational Exponents – Basic Ex 1 & Ex 2 http://bit.ly/65raexb or http://bit.ly/65raexc • Khan Academy: Simplifying Rational Exponents http://bit.ly/65raexd
6.6	Solving Radical Equations	• Patrick JMT: Solving Equations Involving Rational Exponents http://bit.ly/66srea • Patrick JMT: Solving Equations Involving Square Roots http://bit.ly/66sreb • Khan Academy: Solving Square-Root Equations http://bit.ly/66srec
6.7	Graphing Radical Equations	• Khan Academy: Graphs of Square-Root Functions http://bit.ly/67grea • Khan Academy: Square-Root Functions & their Graphs http://bit.ly/67greb
6.8	Graphing Radical Equations with Cubed Roots	• Math Bits Notebook: Square-Root & Cube Root Functions http://bit.ly/68grea • Snap Math: Domain and Range of Cubed Root http://bit.ly/68greb • Graphing Cube Root Functions http://bit.ly/68grec
6.9	Solving and Graphing Radical Equations	• Purple Math: Graphing Radical Functions (Pages 1-3) http://bit.ly/69sgrea • Patrick JMT: Solving an Equation Involving a Single Radical (Square Root) – Ex 1 http://bit.ly/69sgreb • Patrick JMT: Solving an Equation Containing Two Radicals – Ex 1 http://bit.ly/69sgrec

Math 3 Unit 6 Worksheet 1 **Name:**_____
Simplifying Radical Expressions **Date:**_____ **Per:**_____

[1-6] 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- 9] Find each real root.

7. $\sqrt{36}$
8. $-\sqrt[3]{27}$
9. $\sqrt{0.01}$

[10-29] Simplify each radical expression. 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. 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 **Name:**_____
Multiplying & Dividing Radical Expressions **Date:**_____ **Per:**_____

[1-4] Simplify each expression.

1. $\sqrt[3]{128x^5}$
2. $\sqrt[3]{81x^7}$
3. $\sqrt[4]{64x^6y^7}$
4. $\sqrt[4]{32x^5}$

[5-19] Multiply and simplify, if possible, assuming all variable expressions are real numbers.

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. $\sqrt{8x} \cdot \sqrt{6xy^2}$
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 x and y 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. 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
$2\sqrt{5x}\cdot y\sqrt{10x^3y^3}$		
$\lvert x^2\rvert\sqrt{200y^5}$		
$2y^2\sqrt{10x^4}$		
$10(xy)^2\sqrt{2y}$		

Math 3 Unit 6 Worksheet 3 **Name:**_____
Adding & Subtracting Radical Expressions **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 **Name:**_____
Multiplying & Dividing Binomial Radical Expressions **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. $\frac{6}{4-\sqrt{10}}$

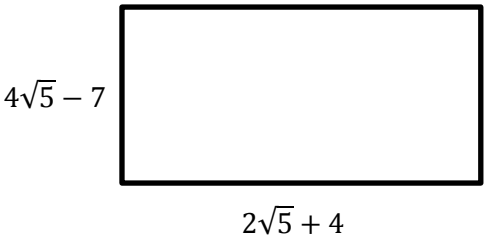
20. $\frac{12}{\sqrt{23}-9}$

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

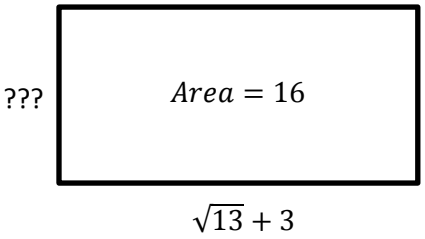
22. $\frac{2+\sqrt{8}}{3\sqrt{8}-2}$

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

24. Find the perimeter and area of the rectangle



25. Find the unknown side and **<u>verify the area</u>**



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. $\left(27^{-\frac{2}{3}}\right)^{-1}$
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. $\left(\sqrt[4]{y}\right)^3$
23. $\left(\sqrt[3]{2xy}\right)^6$
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. $\left(125x^6\, y^{\frac{1}{2}}\right)^{\frac{2}{3}}$

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

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

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

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

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

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

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

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

Math 3 Unit 6 Worksheet 6 **Name:**_____
Solving Radical Equations **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. $\sqrt{x + 9} = 1 + \sqrt{2 + x}$

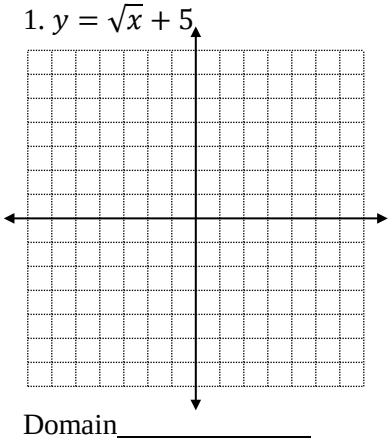
20. $\sqrt{x} = \sqrt{x - 8} + 2$

Math 3 Unit 6 Worksheet 7
Graphing Radical Equations

Name:_____
Date:_____ **Per:**_____

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

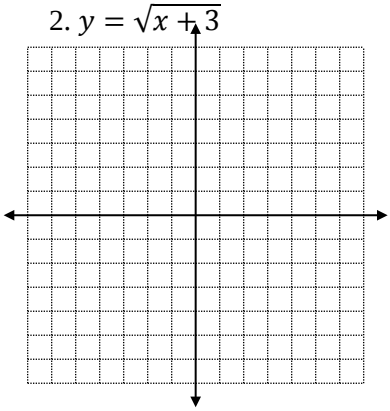
1. $y = \sqrt{x} + 5$



Domain_____

Range_____

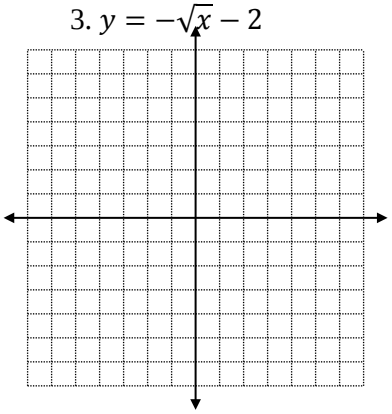
2. $y = \sqrt{x + 3}$



Domain_____

Range_____

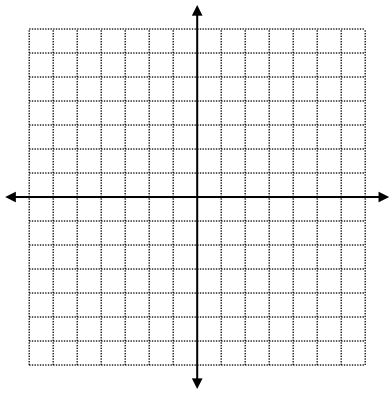
3. $y = -\sqrt{x} - 2$



Domain_____

Range_____

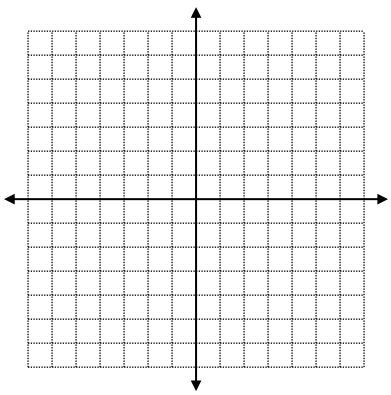
4. $y = 3\sqrt{x + 1} - 6$



Domain_____

Range_____

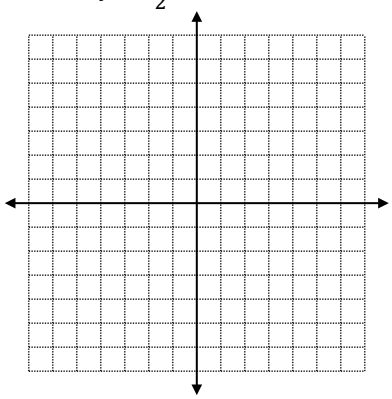
5. $y = -2\sqrt{x - 2} + 1$



Domain_____

Range_____

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

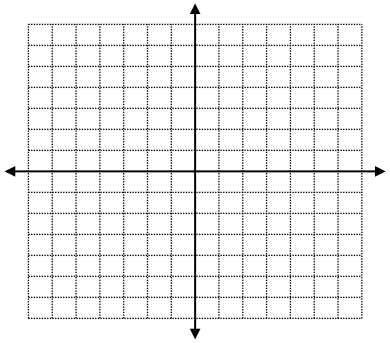


Domain_____

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

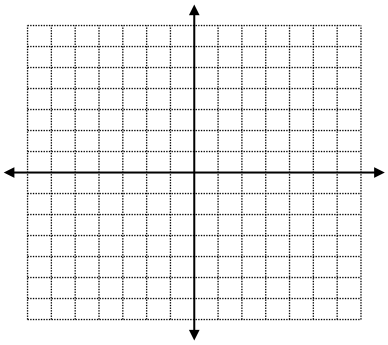
c) The open interval where f is increasing

d) The average rate of change for f on $0 \leq x \leq 9$

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

a) Domain & Range

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



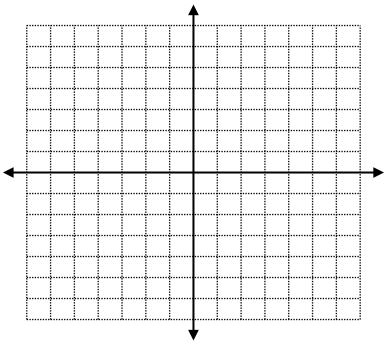
c) The open interval where g is decreasing

d) The open interval where g is negative

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

a) Domain & Range

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



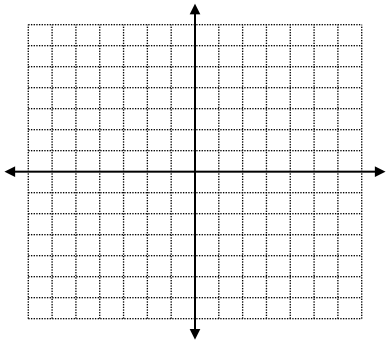
c) The open interval where h is positive

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



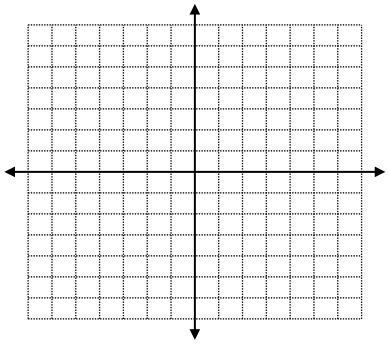
c) The open interval where the function is increasing

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 $x = 5$

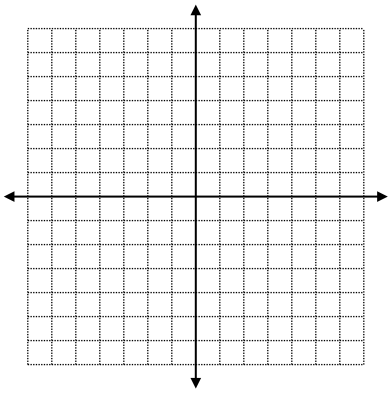
d) The open interval where f is positive

Math 3 Unit 6 Worksheet 8
Graphing Radical Equations

Name:_____
Date:_____ **Per:**_____

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

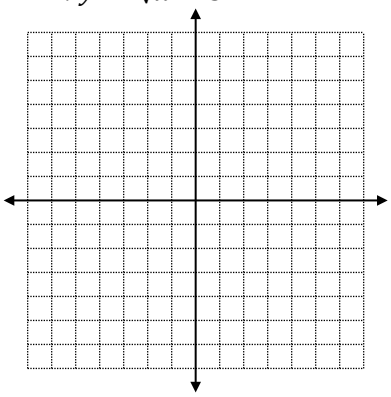
1. $y = \sqrt[3]{x} + 2$



Domain_____

Range_____

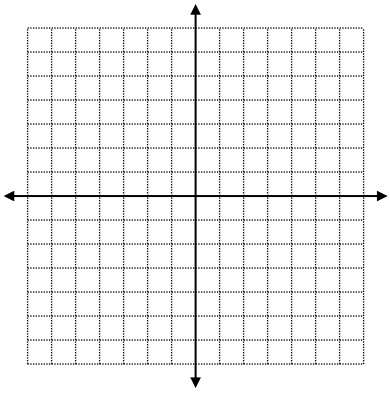
2. $y = \sqrt[3]{x - 3}$



Domain_____

Range_____

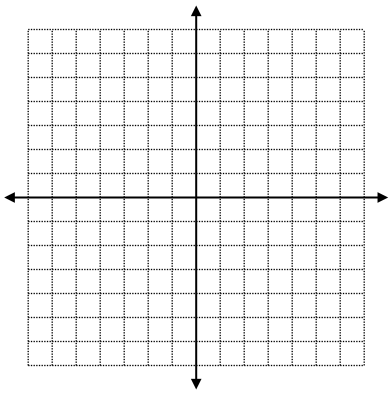
3. $y = -\sqrt[3]{x} - 1$



Domain_____

Range_____

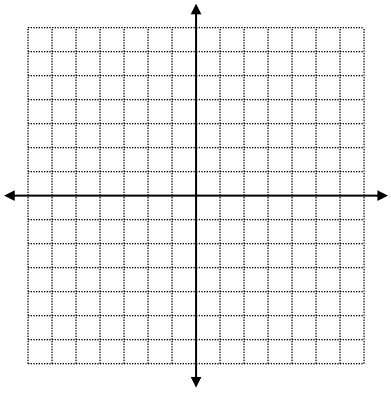
4. $y = 2\sqrt[3]{x + 1} - 4$



Domain_____

Range_____

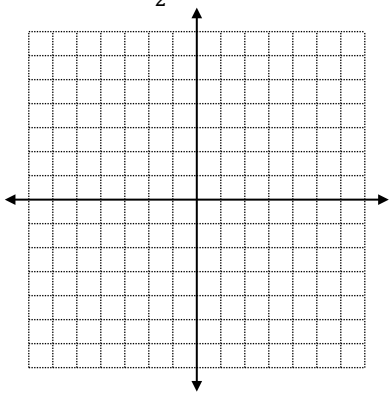
5. $y = -2\sqrt[3]{x - 2} + 1$



Domain_____

Range_____

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



Domain_____

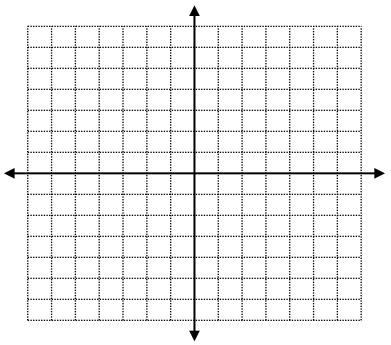
Range_____

[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) $x - and\ y - intercept(s)$



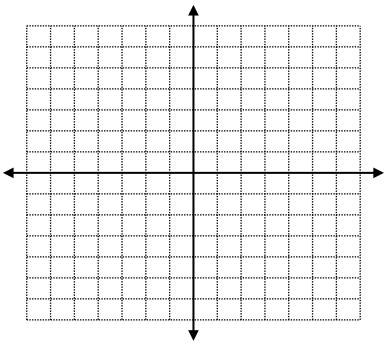
   c) The open interval where g is decreasing

   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 $-5 \leq x \leq 2$

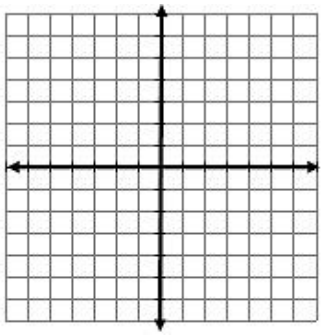
Math 3 Unit 6 Worksheet 9
Solving and Graphing Radical Equations

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) .

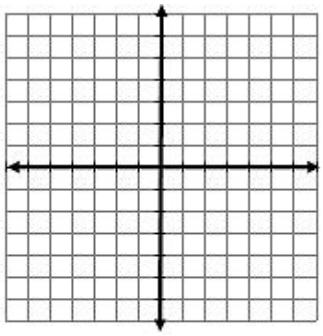
$f(x) = \sqrt{x+1}$ and $g(x) = x - 1$



$f(x) = g(x)$ *at* $x =$ ___

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

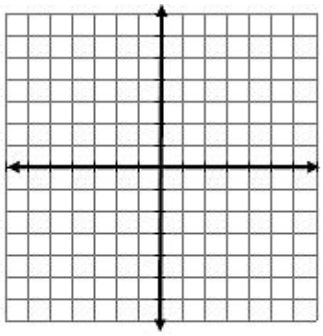
b) Rewrite the algebraic equation into a system of equations and accurately graph.



$f(x) = g(x)$ *at* $x =$ ___

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

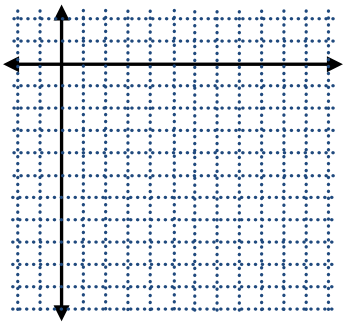
b) Rewrite the algebraic equation into a system of equations and accurately graph.



$f(x) = g(x)$ *at* $x =$ ___

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* $x =$ ___

[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. $f\big(g(x)\big)=15$
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. $\sqrt{x+7}=x-5$

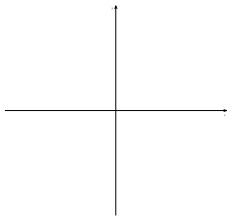
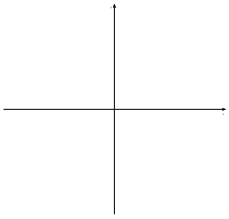
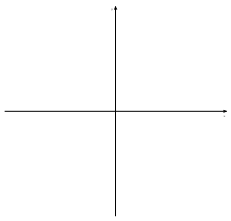
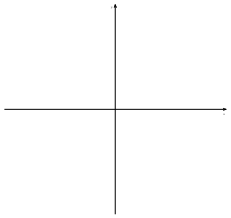
Math 3 Unit 6 Review Worksheet 1 **Name:**_____
Radical Functions **Date:**_____ **Per:**_____

[1-18] Simplify the following:

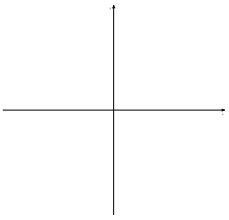
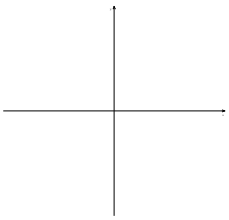
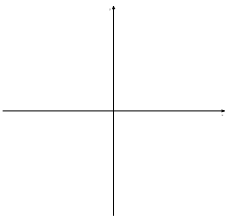
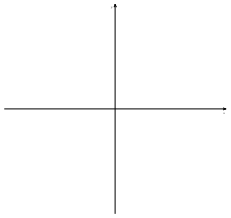
1. $\sqrt{49m^2}$
2. $\sqrt{27m^4}$
3. $\sqrt{121m^6n^8}$
4. $\sqrt[3]{-27}$
5. $\sqrt[3]{8m^3}$
6. $\sqrt[5]{-32}$
7. $\sqrt{80m^4n^5}$
8. $\sqrt{147m^3n^4}$
9. $\frac{18}{\sqrt{13}+2}$
10. $\frac{1}{\sqrt[3]{4}}$
11. $\frac{5}{\sqrt[3]{25x^2}}$
12. $\frac{\sqrt{20x^4y^2}}{\sqrt{5xy^3}}$
13. $\frac{3x}{\sqrt{7x}}$
14. $\sqrt{8x^3}+3x\sqrt{2x}$
15. $4m\sqrt{75mn^6}-2n^2\sqrt{48m^3n^2}$
16. $7\sqrt{2x^3y^6}\cdot\sqrt{2xy}$
17. $\sqrt{27x^2y}\cdot\sqrt{x^3y^5}$
18. $\frac{-3}{\sqrt{7}-5}$

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

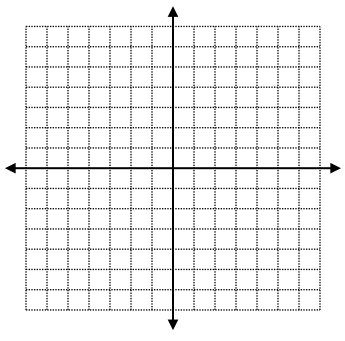
a) $y = x^2$ b) $y = (x-2)^2 + 3$ c) $y = |x|$ d) $y = |x+2| + 1$

e) $y = \sqrt{x}$ f) $y = \sqrt{x+1} - 2$ g) $y = \sqrt[3]{x}$ h) $y = \sqrt[3]{x-1} - 1$

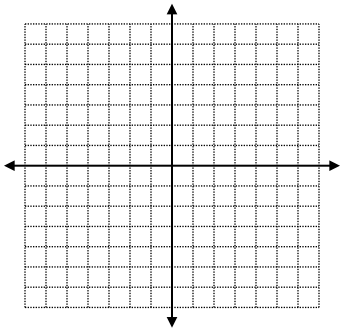





20. Given: $f(x) = (x-2)^2 + 5$, $x \geq 2$. Sketch $f(x)$ and identify its domain and range.



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

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



[22-24] Solve the following equation for *x*:

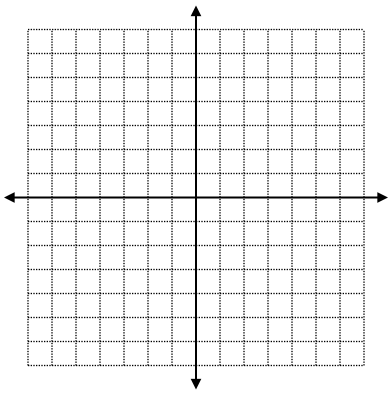
22. $\frac{1}{4}\sqrt{x+3} - 1 = 0$

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

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

25. 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.



$f(x)$ = _____

$g(x)$ = _____

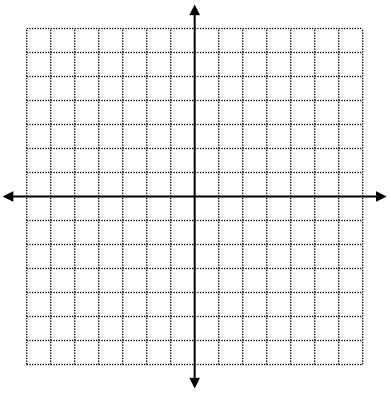
For $f(x) = g(x)$, x = _____

[26-28] Graph the following and find the following:

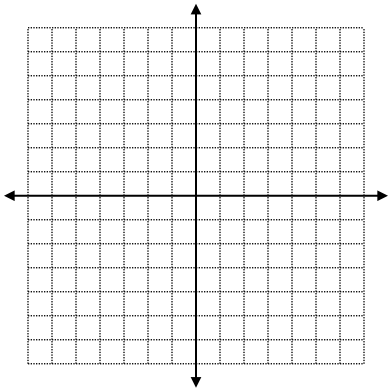
a) *x*-intercept and *y*-intercept
b) Domain and Range
c) the open interval where *f* is increasing
d) the open interval where *f* is decreasing
e) the open interval where *f* is negative
f) the open interval where *f* is positive
g) Average rate of change on the specified interval

- $[3, 7]$ for problem #6
- $[-2, 1]$ for problem #7
- $[-4, 4]$ for problem #8

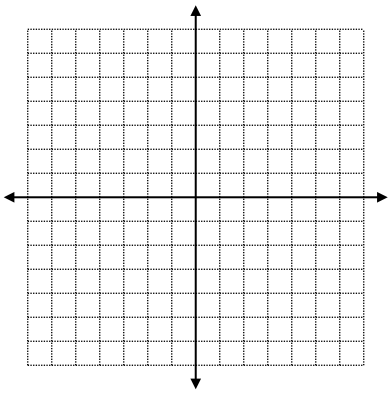
26. $f(x) = \frac{1}{2}\sqrt{x-3} - 1$



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



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



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

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

30. Selected Response:

Given $f(x) = x^2 - 4$ and $g(x) = x + 2$, which of the following is true? Choose **ALL** that apply.

(A) $\frac{f(x)}{g(x)} = x - 2,\ x \neq -2$ (B) $f\big(g(x)\big) = x^2 + 4x$ (C) $(g \cdot f)(x) = x^2 - 2$

[31-35]: Matching.

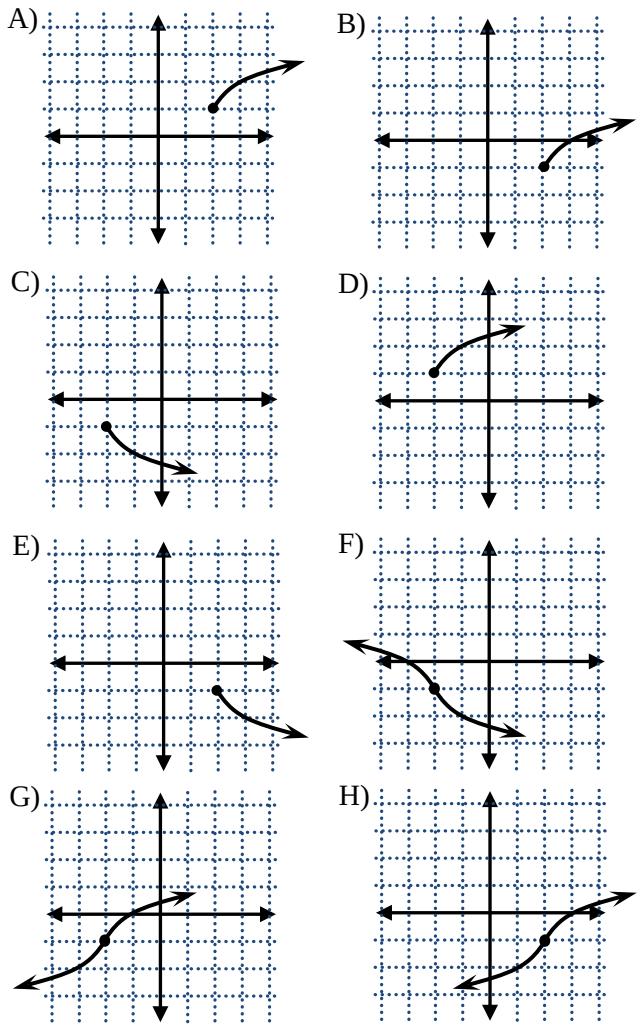
31. $y = \sqrt{x-2} - 1$

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

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

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

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



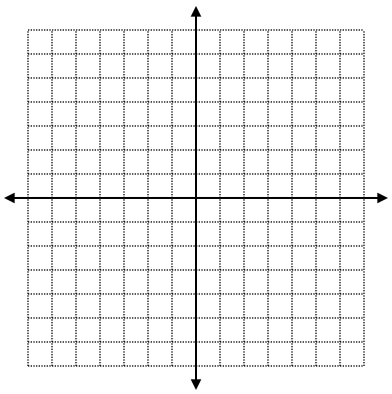
[36-38]: Solve for *x*.

36. $75 - 4\sqrt{x-5} = 39$

37. $3\sqrt{5x+4} = 6\sqrt{2x}$

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

39. Go back to problem #38. 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.

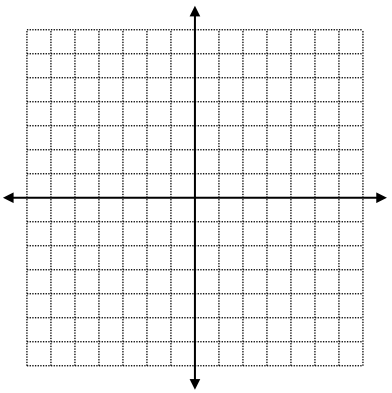


40. Given $f(x) = 2\sqrt{x+5} - 4$

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 $-4 \leq x \leq 11$.

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

Math 3 Unit 6 Review Worksheet 2 **Name:**_____
Radical Functions **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

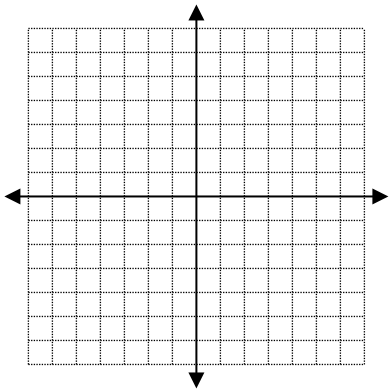
3. Choose which of the following expression(s) is equivalent to $4x\sqrt{12x}$ 3._____
{Hint: There are three correct responses}
A) $8x\sqrt{3x}$ B) $24\sqrt{x^3}$ C) $6x\sqrt{3x} + 2x\sqrt{3x}$ D) $8\sqrt{3x^3}$ E) $12x\sqrt{2x}$

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) $-\frac{4}{2}xy^3$

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 $-4 \le x \le 44$ _____ 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: $\frac{8\sqrt[3]{7}}{2\sqrt[3]{25}}$

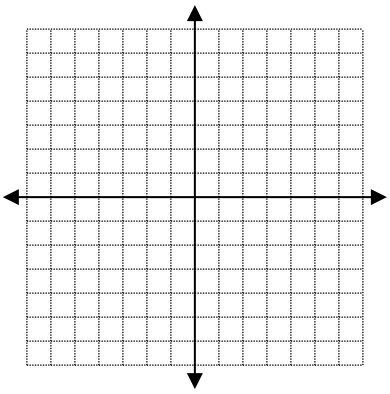
10._____

11._____

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

13. Simplify: $\dfrac{3a^5\sqrt{8x^7}}{a\sqrt{6x^8}}$ 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: $\left(8 - 3\sqrt{2}\right)^2$

15._____

16._____

Math 3 Unit 6 Selected Answers

Selected Answers to Math 3 Unit 6 Worksheet #1:

1. ± 5 3. $\pm\frac{7}{11}$ 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. $6x^3\sqrt[3]{3x^2y}$ 15. $x^2y^3\sqrt{6}$
17. $3c^2|b|\sqrt[4]{2c^2}$ 19. $10 + 7\sqrt{2}$ 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. ½ 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.
$\{3\ only\}$ 17. $\{4\ only\}$ 19. $\{9\ only\}$

Selected Answers to Math 3 Unit 6 Worksheet #10:

1. $x^2 + 4x - 12$; $\mathbb{R}$ 3. $-x^2 - 2x + 8$; $\mathbb{R}$ 5. $x + 3\sqrt{x} - 10$; $[0, \infty)$ 7. $\frac{1}{5}$ 9. 1 11. $-x^2 + 2x - 4$
13. $-(2x - 4)^2$ 15. $(2x + 2)^2$ 17. $(a + 1)^2$

Math 3 Unit 6 Selected Answers

Selected Answers to Math 3 Unit 6 Worksheet #11:

7. a) $y = \pm\sqrt{\frac{1}{2}(x-2)}$ b) D: $\mathbb{R}$; R: $[2,\infty)$ c) D: $[2,\infty)$; R: $\mathbb{R}$ d) Inverse is not a function

9. a) $y = \pm\sqrt{-x} + 2$ b) D: $(-\infty,\infty)$; R: $(-\infty,0]$ c) D: $(-\infty,0]$; R: $(-\infty,\infty)$ d) Inverse is not a function 11. a) $y = \frac{1}{x}$ b) $D: x \neq 0$; $R: y \neq 0$ c) $D: x \neq 0$; $R: y \neq 0$ d) Inverse is a function 13. a) $y = -\frac{1}{x} + 3$ b) $\frac{5}{2}$ c) 1 d) x

Selected Answers to Math 3 Unit 6 Review WS 1:

25. {86} 26. {4/3} 27. $\{-2\}$; 1 is extraneous 29. $x^2 - x - 6$ 30. $\frac{1}{2x+1}$, $x \neq 3$ 31. $2x^2 + 3x - 5$ 32. b. $D = [-5,\infty)$ & $R = [-4,\infty)$ c. $x - int = (-1,0)$ & $y - int = (0,2\sqrt{5} - 4)$ d. $(-5,\infty)$ e. $\emptyset$ f. $(-1,\infty)$ g. $(-5,-1)$ h. $Avg\ rate\ of\ change\ on\ [-4,11] = 2/5$ 33. a. $f(x)$: $D = [2,\infty)$ & $R = (-\infty,-7]$ b. $f^{-1}(x)$: $D = (-\infty,-7]$ & $R = [2,\infty)$ c. $f^{-1}(x) = (x+7)^2 + 2;\ x \leq -7$

Selected Answers to Math 3 Unit 6 Review WS 2:

1. BD 2. CDE 3. ACD 4. DE 5. AB 6. ADE 7. {86} 8. {4/3} 9. $\{-2\}$; 1 is extraneous

11. $x^2 - x - 6$ 12. $\frac{1}{2x+1}$, $x \neq 3$ 13. $2x^2 + 3x - 5$

14. b. $D = [-5,\infty)$ & $R = [-4,\infty)$

c. $x - int = (-1,0)$ & $y - int = (0,2\sqrt{5} - 4)$ d. $(-5,\infty)$ e. $\emptyset$ f. $(-1,\infty)$ g. $(-5,-1)$

h. $Avg\ rate\ of\ change\ on\ [-4,11] = 2/5$

15. a. $f(x)$: $D = [2,\infty)$ & $R = (-\infty,-7]$

b. $f^{-1}(x)$: $D = (-\infty,-7]$ & $R = [2,\infty)$ c. $f^{-1}(x) = (x+7)^2 + 2;\ x \leq -7$