Name: Key Period: ______________ Date: ____________________

Chapter 6 Review

6.1 Roots and Radical Expressions- Simply each radical expression.

1. $\sqrt[4]{m^{18}n^8}$

$m^4n^2\sqrt[4]{m^2}$

2. $\sqrt{c^{80}d^{50}}$

$c^{40}d^{25}$

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

$3y^5$

4. $\sqrt[3]{-32x^5y^2}$

$-8 \cdot 4$

$-2x\sqrt[3]{4x^2y^2}$

5. You can use the expression $D = 1.2\sqrt{h}$ to approximate the visibility range D, in miles, from a height of h feet above the ground.

a. Estimate the visibility from a height of 900 feet.

$D = 1.2\sqrt{900} = 1.2(30) = 36$ miles

b. How far above the ground is an observer whose visibility range is 84 miles?

$\frac{84 = 1.2\sqrt{h}}{1.2}$ $\quad (70)^2 = (\sqrt{h})^2 \quad h = 4900$ ft

6. You can approximate the speed of a falling object as $v = 8\sqrt{d}$, where v is the speed in feet per second and d is the distance, in feet, the object has fallen. Express d in terms of v.

$\frac{v}{8} = \frac{8\sqrt{d}}{8} \quad \left(\frac{v}{8}\right)^2 = (\sqrt{d})^2 \quad \left(\frac{v}{8}\right)^2 = d$

6.2 Multiplying and Dividing Radical Expressions- Multiply or divide and simplify.

7. $\sqrt{3x^4} \cdot \sqrt{24x^3}$

$\sqrt{72x^7}$

$36 \cdot 2$

$6x^3\sqrt{2x}$

8. $\sqrt[3]{4} \cdot \sqrt[3]{18}$

$\sqrt[3]{72}$

$8 \cdot 9$

$2\sqrt[3]{9}$

9. $\frac{\sqrt[3]{640w^3z^8}}{\sqrt[3]{5wz^4}}$

$\sqrt[3]{\frac{640w^3z^8}{5wz^4}}$

$\sqrt[3]{128w^2z^4}$

$64 \cdot 2$

$4z\sqrt[3]{2w^2z}$

10. $\frac{\sqrt{18x^5y}}{\sqrt{2x}}$

$\sqrt{\frac{18x^5y}{2x}} = \sqrt{9x^4y}$

$3x^2\sqrt{y}$

6.3 Adding and Subtracting Radicals- Simplify.

11. $3\sqrt{18}+2\sqrt{72}$ $9\cdot2 \quad 36\cdot2$ $3\cdot3\sqrt{2}+2\cdot6\sqrt{2}$ $9\sqrt{2}+12\sqrt{2}$ $21\sqrt{2}$	**12.** $\sqrt{32}+\sqrt{8}$ $16\cdot2 \quad 4\cdot2$ $4\sqrt{2}+2\sqrt{2}$ $6\sqrt{2}$
13. $(2+\sqrt{5})(3+\sqrt{5})$ $6+2\sqrt{5}+3\sqrt{5}+\sqrt{\cancel{25}}$ 5 $11+5\sqrt{5}$	**14.** $(\sqrt{10}+3)^2$ $(\sqrt{10}+3)(\sqrt{10}+3)$ $\sqrt{\cancel{100}}+3\sqrt{10}+3\sqrt{10}+9$ $19+6\sqrt{10}$
15. $\frac{(4-3\sqrt{7})(1-2\sqrt{7})}{(1+2\sqrt{7})(1-2\sqrt{7})}=\frac{4-8\sqrt{7}-3\sqrt{7}+6\cdot7}{1(\cancel{-2\sqrt{7}+2\sqrt{7}})-4\cdot7}$ 42 28 $\frac{46-11\sqrt{7}}{-27}$	**16.** $\frac{(5)(2+\sqrt{3})}{(2-\sqrt{3})(2+\sqrt{3})}=\frac{10+5\sqrt{3}}{4+\cancel{2\sqrt{3}}-\cancel{2\sqrt{3}}-3}$ $10+5\sqrt{3}$

6.4 Rational Exponents- Write each expression in simplest form.

17. $36^{\frac{1}{4}}\cdot36^{\frac{1}{4}}$ $36^{1/4+1/4}=36^{1/2}$ $\sqrt{36}=6$	**18.** $\left(x^{-\frac{4}{3}}y^{\frac{3}{5}}\right)^{15}$ $x^{-\frac{4}{3}\cdot15}y^{\frac{3}{5}\cdot15}=x^{-20}y^{9}$ $\frac{y^9}{x^{20}}$
19. $\left(\frac{81x^{14}}{16x^{12}}\right)^{\frac{3}{4}}$ $\frac{81^{3/4}x^{14\cdot3/4}}{16^{3/4}x^{12\cdot3/4}}=\frac{81^{3/4}x^{21/2}}{16^{3/4}x^{9}}$ $\frac{\sqrt[4]{81^3}x^{3/2}}{\sqrt[4]{16^3}}=\frac{3^3x^{3/2}}{2^3}=\frac{27x^{3/2}}{8}$ $\frac{27\sqrt{x^3}}{8}=\frac{27x\sqrt{x}}{8}$	**20.** $(8x^{15}y^{-9})^{-\frac{1}{3}}$ $8^{-1/3}x^{-5}y^{3}=\frac{y^3}{8^{1/3}x^5}$ $\frac{y^3}{\sqrt[3]{8}x^5}=\frac{y^3}{2x^5}$

$\frac{21}{2}-9=\frac{3}{2}$

21. $\left(\frac{16x^{14}}{81y^{18}}\right)^{-\frac{1}{2}}$ $\frac{16^{-1/2}x^{-7}}{81^{-1/2}y^{-9}} = \frac{81^{1/2}y^9}{16^{1/2}x^7}$ $\frac{9y^9}{4x^7}$	**22.** $\sqrt{5}\cdot\sqrt[3]{5}$ $5^{1/2}\cdot 5^{1/3} = 5^{1/2+1/3} = 5^{5/6}$ $\sqrt[6]{5^5}$

6.5 Solving Radical Equations- Solve. Check for extraneous solutions.

23. $\frac{3(x+3)^{\frac{3}{2}}}{3} = \frac{81}{3}$ $[(x+3)^{3/2}]^{2/3} = (27)^{2/3}$ $x+3 = \sqrt[3]{27^2}$ $x+3 = 3^2$ $x+3=9$ $\boxed{x=6}$ $3(6+3)^{3/2}=81$ $3(9)^{3/2}=81$ $3(27)=81$ ✓	**24.** $3(x-2)^{\frac{3}{4}}+4=28$ $3(x-2)^{3/4}=24$ $((x-2)^{3/4}=8)^{4/3}$ $x-2=8^{4/3}$ $x-2=\sqrt[3]{8^4}$ $x-2=2^4$ $x-2=16$ $\boxed{x=18}$ $3(16)^{3/4}+4=28$ $3(8)+4=28$ ✓
25. $\sqrt{3x+7}+1=x$ $\sqrt{3x+7}=x-1$ $3x+7=(x-1)^2$ $3x+7=x^2-2x+1$ $x^2-5x-6=0$ $(x-6)(x+1)$ $x=\boxed{6}, \cancel{-1}$ ext $\sqrt{18+7}+1=6$ $5+1=6$ ✓ $\sqrt{-3+7}+1=-1$ $2+1=-1$ ✗	**26.** $\sqrt{10x}-2\sqrt{5x-25}=0$ $(\sqrt{10x})^2=(2\sqrt{5x-25})^2$ $10x=4(5x-25)$ $10x=20x-100$ $-10x=-100$ $\boxed{x=10}$ $\sqrt{100}-2\sqrt{50-25}=0$ $10-10=0$ ✓

6.6 Function Operations- Perform the given function operations. State the domain.

For #27-30, let $f(x)=3x^2$ and $g(x)=2-5x$

27. $f(x)-g(x)$ $3x^2-(2-5x)$ $3x^2+5x-2$ $\quad\mathbb{R}$	**28.** $f(x)\cdot g(x)$ $3x^2(2-5x)$ $-15x^3+6x^2$ $\quad\mathbb{R}$
29. $\frac{f(x)}{g(x)}$ $\quad\frac{3x^2}{2-5x}$ $\quad\mathbb{R}\ x\neq 2/5$	**30.** $(g-f)(x)$ $2-5x-3x^2$ $-3x^2-5x+2$ $\quad\mathbb{R}$

For #31-32, let $f(x)=x^2$ and $g(x)=3x+1$

31. $(g\circ f)(x)$ $3(x^2)+1$ $3x^2+1$	**32.** $(f\circ g)(23)$ $(3x+1)^2$ $9x^2+6x+1$ $9(23)^2+6(23)+1=4900$

33. Helena works in a department store. Three times per year she is allowed to combine her employee discount with special sales prices. Let x be the retail price of a blouse.

a. Helena's employee discount is 20% off. Write a function $E(x)$ that represents the cost of the blouse after the discount.

$E(x) = 0.8x$

b. Due to a manufacturer's incentive, the blouse is marked down 25%. Write a function $M(x)$ that represents the sale price.

$M(x) = 0.75x$

c. The sales tax on clothing is 6%. Write a function $T(x)$ that describes the cost of a clothing item with sales tax included.

$T(x) = 1.06x$

d. Helena found a blouse to which the discounts apply. Use the function composition $f = T \circ E \circ M$ to write the function $f(x)$ that represents the price Helena will pay for the blouse.

$f(x) = 1.06(.8(.75x)) = 0.636x$

6.7 Inverse Relations- Find the inverse and state whether the inverse is a function.

34. $f(x) = 6x + 1$ $x = 6y + 1$ $x - 1 = 6y$ $f^{-1}(x) = \frac{x-1}{6}$ yes; function	**35.** $f(x) = \sqrt{x+4}$ $x = \sqrt{y+4}$ $x^2 = y+4$ $f^{-1}(x) = x^2 - 4$ yes, function
36. $f(x) = 3x^2 + 1$ $x = 3y^2 + 1$ $x - 1 = 3y^2$ $\frac{x-1}{3} = y^2$ $f^{-1}(x) = \pm\sqrt{\frac{x-1}{3}}$ not a function	**37.** $f(x) = \frac{3}{7}x + 4$ $x = \frac{3}{7}y + 4$ $x - 4 = \frac{3}{7}y$ $7(x-4) = 3y$ $\frac{7x-28}{3}$ $f^{-1}(x) = \frac{7x - \cancel{28}}{3}$ yes, function

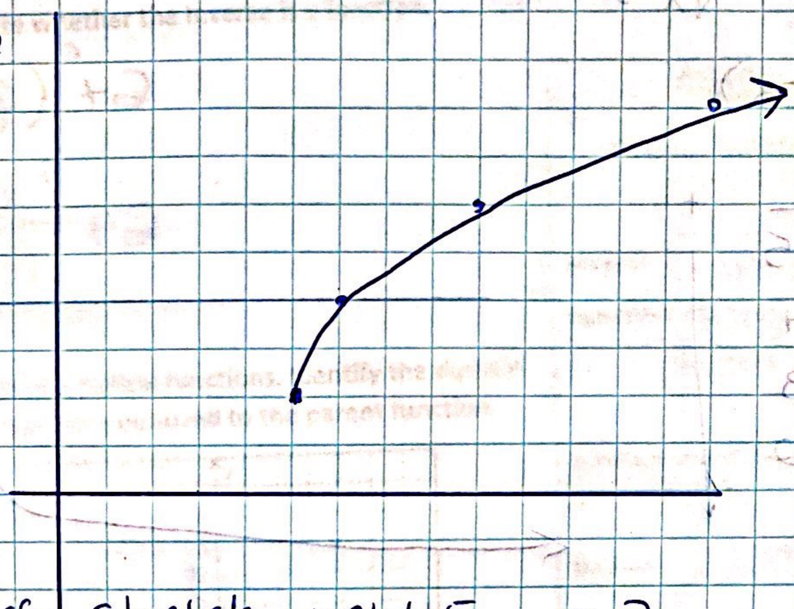
6.8 Graphing Radical Functions- Graph the following.

Graph the following on a separate piece of paper. Identify the domain, range, and all transformation from the parent function.	
38. $y = 2\sqrt{x-5} + 2$ See graph paper	**39.** $y = \sqrt{x+3}$
40. $y = \sqrt[3]{x-2} - 3$	**41.** $y = -3\sqrt[3]{x+1}$
Rewrite the following to be easily graphed using transformations. Describe the graph.	
42. $y = \frac{1}{10}\sqrt[3]{125x - 250} - 3$ $y = \frac{1}{10}\sqrt[3]{125(x-2)} - 3$ $\frac{1}{10}\sqrt[3]{125}\sqrt[3]{x-2} - 3$ $\frac{1}{10} \cdot 5\sqrt[3]{x-2} - 3$ $\frac{1}{2}\sqrt[3]{x-2} - 3$ • compress • right 2 • up 3	**43.** $y = -\frac{1}{2}\sqrt{36x + 108} + 5$ $y = -\frac{1}{2}\sqrt{36(x+3)} + 5$ $-\frac{1}{2}\sqrt{36}\sqrt{x+3} + 5$ $-\frac{1}{2} \cdot 6\sqrt{x+3} + 5$ $-3\sqrt{x+3} + 5$ • reflect • stretch • left 3 • up 5

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

$(h,k) = (5,2)$

	x	y	
	5	2	
+1	6	4	+2
+3	9	6	
+5	14	8	



D: $[5, \infty)$

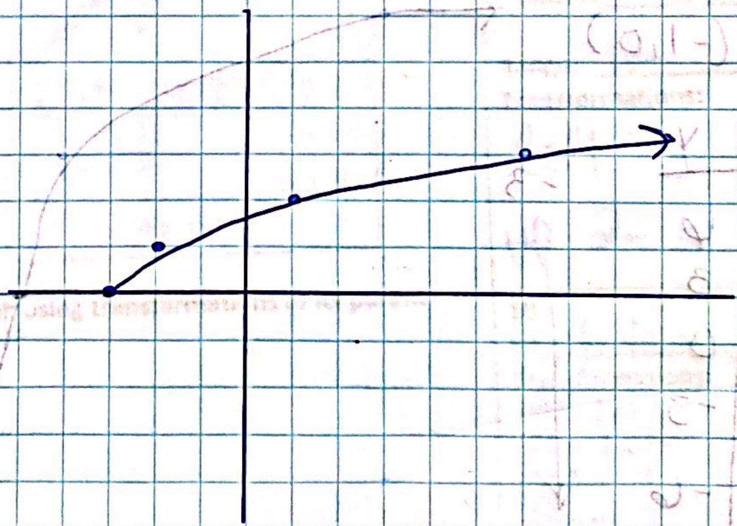
R: $[2, \infty)$

transf: stretch, right 5, up 2

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

$(-3, 0)$

	x	y	
	-3	0	
+1	-2	1	+1
+3	1	2	
+5	6	3	



D: $[-3, \infty)$

R: $[0, \infty)$

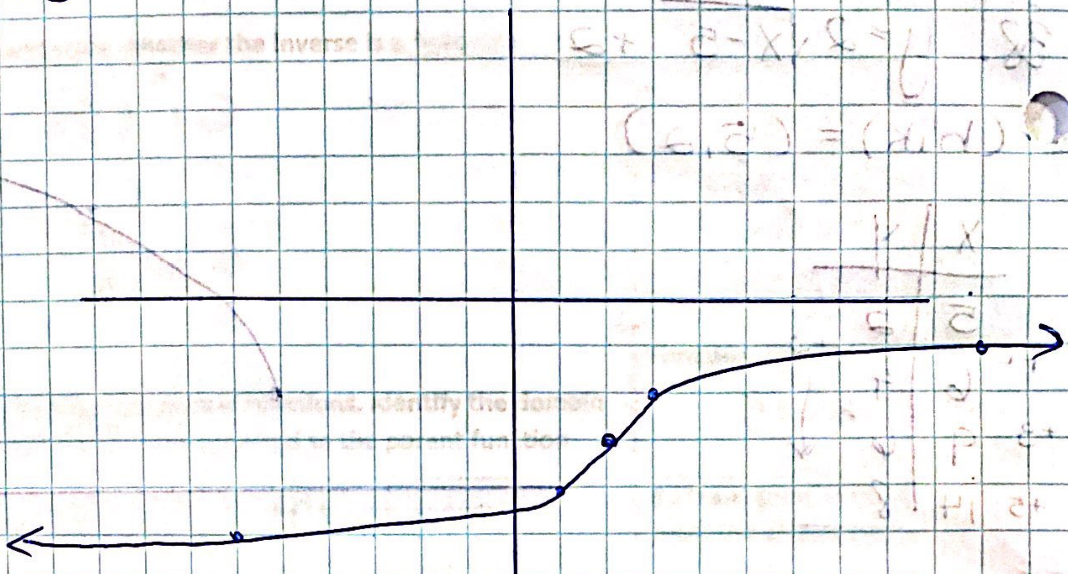
transf: left 3

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

$(2, -3)$

	x	y
-7	-6	-5
-1	1	-4
	2	-3
+1	3	-2
+7	10	-1

+1



D: $\mathbb{R}$

R: $\mathbb{R}$

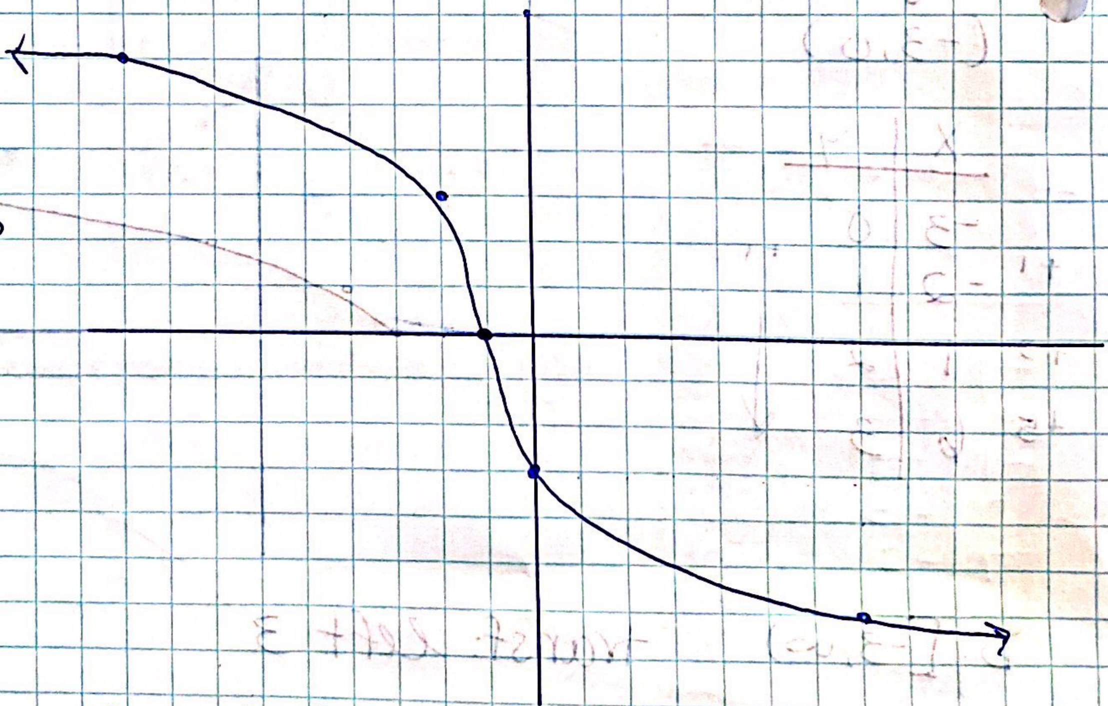
transf: right 2, down 3

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

$(-1, 0)$

	x	y
-7	-9	6
-1	-2	3
	-1	0
+1	0	-3
+7	7	-6

-3



D: $\mathbb{R}$

R: $\mathbb{R}$

transf: reflect, stretch, left 1

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