HW 9-4 7.  $\frac{1}{27x^3}$  13.  $(x+9)^{\frac{5}{4}}$  17.  $b^{\frac{2}{3}}$ 

2. 32

8.  $\sqrt[5]{5^3}$  or  $\sqrt[5]{125}$ 

18.  $7^{\frac{7}{24}}$ 

3.  $\frac{1}{27}$ 

9.  $5\sqrt[5]{x^3}$  14.  $7^{\frac{5}{9}}$ 

19.  $11^{\frac{2}{35}}$ 

4. -8

10.  $\sqrt[5]{(x+6)}$  15.  $10^{\frac{35}{36}}$ 

20.  $y^{\frac{1}{30}}$ 

22. 1

5. 25

11.  $x^{\frac{3}{4}}$ 

16.  $5^{\frac{5}{12}}$ 

23.  $\frac{3}{\sqrt{x^3}}$  or  $\frac{3}{(\sqrt{x})^3}$ 

6. 125*x*<sup>9</sup>

12.  $7x^{\frac{4}{7}}$ 

Name \_\_\_\_\_

Alg 2 HW9,-4

Simplify. Write your answers as fractions, if necessary.

1. 
$$64^{\frac{1}{3}} = 4$$
2.  $16^{\frac{5}{4}}$ 
3.  $81^{-\frac{3}{4}}$ 
4.  $(-32)^{\frac{3}{5}}$ 
5.  $\left(-\frac{1}{125}\right)^{-\frac{2}{3}}$ 
6.  $(25x^{6})^{\frac{3}{2}}$ 
7.  $\left(\frac{1}{9x^{2}}\right)^{\frac{3}{2}} = (-2)^{\frac{3}{2}}$ 

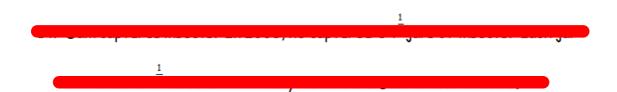
State each expression as a simplified radical expression.

8. 
$$5^{\frac{3}{5}}$$
 =  $5^{\frac{3}{5}}$  9.  $5x^{\frac{3}{5}}$  10.  $(x+6)^{\frac{1}{5}}$  =  $5^{\frac{1}{5}}$  (x+6)

State each radical expression in exponential form.

11. 
$$\sqrt[4]{x^3}$$

13. 
$$\sqrt[4]{(x+9)^5}$$



Multiply and simplify.

14. 
$$7^{\frac{1}{9}} \cdot 7^{\frac{4}{9}}$$
  
:  $7^{\frac{5}{9}}$ 

15. 
$$10^{\frac{2}{9}} \cdot 10^{\frac{3}{4}}$$

$$= 10^{35/36} \cdot 10^{35/36}$$

$$= 10^{35/36} \cdot 10^{35/36}$$

Divide and simplify.

17. 
$$\frac{b^{\frac{7}{9}}}{b^{\frac{1}{9}}} : b^{\frac{6}{4}}$$

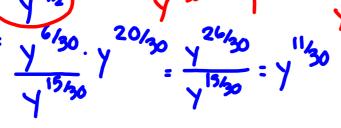
18. 
$$\frac{7^{\frac{3}{8}}}{7^{\frac{1}{12}}} = \frac{7^{\frac{9}{24}}}{7^{\frac{2}{24}}}$$
$$= 7^{\frac{7}{24}}$$

19. 
$$\frac{\sqrt[5]{1}}{\sqrt[7]{11}} = \frac{\sqrt[7]{5}}{\sqrt[7]{35}} = \sqrt[7]{\frac{2}{35}}$$

Simplify.

20. 
$$\frac{5\sqrt{y}}{\sqrt{\frac{1}{2}}} \cdot y^{\frac{2}{3}}$$

$$\frac{21. \sqrt[3]{x \cdot x^{\frac{1}{6}}}}{(x^{2})^{\frac{1}{8}}} \cdot \frac{x}{x^{\frac{1}{4}}} \cdot \frac{x}{x^{\frac{1}{4$$



22.If 
$$f(x) = 3x^{-\frac{1}{4}}$$
, find  $f(81)$   
=  $3(81)^{-1/4}$  =  $3(\frac{1}{81})^{1/4}$  =  $34\sqrt{\frac{1}{81}}$  ;  $3 \cdot \frac{1}{3}$  : 1

23. Written without fractional or negative exponents, 
$$3x^{-\frac{3}{2}}$$
 is equal to 
$$3x^{-\frac{3}{2}} = \frac{3}{x^{\frac{3}{2}}} = \frac{3}{\sqrt{x^{\frac{3}{2}}}} = \frac{3}{\sqrt{x^{\frac{3}{2}}}}$$

Operations with Fractional Exponents and Simplifying Radical Expressions

Unit 9 Day 5

## Operations with Fractional Exponents and Simplifying Radical Expressions

Write the following expressions as a single term with a rational exponent.

1. 
$$\sqrt[3]{x} \cdot \sqrt{x} = x^{\frac{1}{3}} \cdot x^{\frac{1}{3}}$$

$$= x^{\frac{1}{3}} \cdot x^{\frac{1}{3}}$$

$$= x^{\frac{1}{3}} \cdot x^{\frac{1}{3}}$$

$$= (2a)^{\frac{1}{3}} \cdot (2a)^{\frac{1}{3}}$$

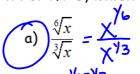
$$= (2a)^{\frac{1}{3}} \cdot (2a)^{\frac{1}{3}}$$

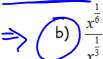
$$= (2a)^{\frac{1}{3}} \cdot (2a)^{\frac{1}{3}}$$

Using the rules for positive and negative exponents, simplify the following expressions.

$$\frac{\left(\frac{m^{2}}{\frac{1}{m^{3}}}\right)^{-\frac{1}{2}}}{\frac{1}{m^{3}}} = \left(\frac{x^{2}}{m^{3}}\right)^{-\frac{1}{3}} = \left(\frac{x^{2}}{x^{2}}\right)^{-\frac{1}{3}} = \left(\frac{x^{2$$

4. For  $x \neq 0$ , which expression(s) are equivalent to one divided by the sixth root of x?



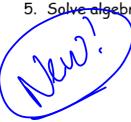


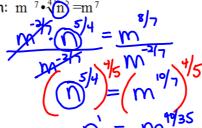


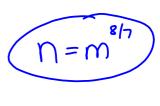


With the following two questions, you will need to think about how you can eliminate a fractional exponent so that the variable that you are solving for is to the first power.

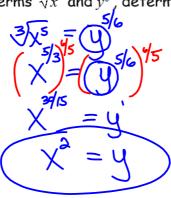
5. Solve algebraically for n:  $m^{-\frac{7}{7}} \cdot \sqrt[4]{n^5} = m^{\frac{9}{7}}$ 







6. Given the equal terms  $\sqrt[3]{x^5}$  and  $y^{\frac{5}{6}}$ , determine and state y in terms of x. Solve for (



When written as a radical  $\sqrt[n]{b}$ , the **radicand** is b and the **index** is n. The denominator of the exponent in  $a^n = b$  is also the index of the radical. If the index is odd, a negative number can have a negative root. If the index is even, the radicand must be positive to have a real value.

Powers to Memorize: Lecture puloute of								
Base	Power	2	3	4	5			
	2	14	8	16	32			
	3	9	27	81	243			
	4	16	64	256	×			
į	5	25/	125/	625	Х			

7. Simplify. Identify the index and the radicand.

a. 
$$\sqrt[3]{-27} = -3$$
  
I: 3  
Q: -27

b. 
$$\sqrt[4]{16} = 2$$
  
 $I = 4$   
 $R = 16$ 

c. 
$$\sqrt[3]{8y^3}$$

d. 
$$\sqrt{4x^6}$$

Students try
$$\sqrt[3]{64x^6} = 4x^{9/3} = 4x^2$$
 $\sqrt[4]{81y^{12}} = 3y^{19/4} = 3y^3$ 
 $\sqrt[4]{81y^{12}} = 3y^{19/4} = 3y^3$ 
 $\sqrt[4]{81y^{12}} = 3y^{19/4} = 3y^3$ 

$$\sqrt[4]{81y^{12}} = 3y^{13/4} = 3y^3$$

c.  $\sqrt{48x^5y^8}$ 

## Product and Quotient Rule for Radicals

Product Rule:  $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$ , with  $\sqrt[n]{a}$  and  $\sqrt[n]{b}$  as real numbers

Quotient Rule:  $\frac{\sqrt[n]{a}}{\sqrt[n]{b}} = \sqrt[n]{\frac{a}{b}}$  with  $b \neq 0$ , and  $\sqrt[n]{a}$  and  $\sqrt[n]{b}$  as real numbers

8. Simplify using the product rule or quotient rule.

a. 
$$\sqrt[3]{48x^3y^5}$$
 $\sqrt[3]{8x^3y^3} \cdot \sqrt[3]{6y^2}$ 
 $\sqrt[3]{2xy} \sqrt[3]{6y^2}$ 

b. 
$$\sqrt[4]{64x^{10}}$$
 $\sqrt[4]{16x^8} \cdot \sqrt[4]{4x^2}$ 
 $2x^2 \sqrt[4]{4x^2}$ 

d. 
$$\frac{\sqrt[3]{16x^8}}{\sqrt[3]{2x^2}} = \sqrt[3]{\frac{|6x^8|}{2x^2}} = \sqrt[3]{8x^6}$$

d. 
$$\frac{\sqrt[3]{16x^8}}{\sqrt[3]{2x^2}} = \sqrt[3]{\frac{16x^8}{2x^2}} = \sqrt[3]{8x^2}$$
 e.  $\frac{\sqrt{3x^2}}{\sqrt{12x}} = \sqrt{\frac{3}{12x}} = \sqrt{\frac{x}{4}}$  f.  $\frac{\sqrt[4]{5y^5}}{\sqrt[4]{16y}} = \sqrt[3]{\frac{x}{4}}$  f.  $\frac{\sqrt[4]{5y^5}}{\sqrt[4]{16y}} = \sqrt[4]{\frac{x}{4}}$  f.  $\frac{\sqrt[4]{5y^5}}{\sqrt[4]{16y}} = \sqrt[4]{\frac{x}{4}}$ 

## Students try:

$$\frac{\sqrt[4]{2a^{15}}}{\sqrt[4]{32a^3}} = \sqrt[4]{\frac{a^{12}}{16}}$$