Unit 9 Day 6

Solving Radical Equations

HW 9-5

1. You can take the cube root of -27 followed by raising that answer to the fourth power making the answer 81.
2. $3x^2$
3. a. $x^{\frac{8}{15}}$ b. $3^{\frac{5}{12}}$
4. a. $\frac{1}{a^{\frac{1}{3}}}$ or $\frac{1}{\sqrt[3]{a}}$ b. $\frac{1}{b^{\frac{7}{16}}}$ or $\frac{1}{\sqrt[16]{b^7}}$ c. $\frac{1}{b^{\frac{7}{16}}}$ or $\frac{1}{\sqrt[16]{b^7}}$

5. -1 index 3 radicand -1
6. 3 index 4 radicand 81
7. $4a^2b^2\sqrt{2b}$
8. $2a^3b^4\sqrt[4]{3b^2}$
9. $3x^3$
10. $a^4\sqrt{7}$
11. $2b^3$

Name____ Alg 2 HW 9-5

1. Explain how $(-27)^{\frac{4}{3}}$ can be evaluated using properties of rational exponents to result in and integer answer.

See explanation on first slide

2. Given the equal terms $\sqrt[5]{27x^6}$ and $y^{\frac{3}{5}}$, determine and state y, in terms of x. State your answer in simplest form.

$\sqrt[5]{27x^6} = y^{3/5}$

$(27x^6)^{1/5 \cdot 5/3} = y^{3/5 \cdot 5/3}$

$(27x^6)^{1/3} = y$

$y = \sqrt[3]{27x^6} = 3x^2$

3. Write as a single term with a rational exponent.

a. $\sqrt[5]{x} \bullet \sqrt[3]{x}$

$x^{1/5} \cdot x^{1/3}$

$x^{3/15} \cdot x^{5/15}$

$x^{8/15}$

b. $\sqrt[4]{3} \bullet \sqrt[6]{3}$

$3^{1/4} \cdot 3^{1/6}$

$3^{3/12} \cdot 3^{2/12}$

$3^{5/12}$

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

a. $\left(\dfrac{a^{\frac{1}{3}}}{a^{\frac{1}{6}}}\right)^{-2}$ $= \left(\dfrac{a^{1/6}}{a^{1/3}}\right)^{2} = \dfrac{a^{2/6}}{a^{2/3}} = \dfrac{1}{a^{1/3}}$ or $\dfrac{1}{\sqrt[3]{a}}$

b. $\left(\dfrac{b^{2}}{b^{\frac{9}{8}}}\right)^{-\frac{1}{2}} = \left(\dfrac{b^{9/8}}{b^{2}}\right)^{1/2} = \dfrac{b^{9/16}}{b^{1}} = \dfrac{1}{b^{7/16}}$ or $\dfrac{1}{\sqrt[16]{b^{7}}}$

c. $\left(b^{\frac{7}{8}}\right)^{-\frac{1}{2}} = b^{\frac{-7}{16}} = \dfrac{1}{b^{7/16}}$ or $\dfrac{1}{\sqrt[16]{b^{7}}}$

Simplify. Identify the index and the radicand.

5. $\sqrt[3]{-1}$

Answer -1

Index 3

Radicand -1

6. $\sqrt[4]{81}$

Answer 3

Index 4

Radicand 81

Simplify.

7. $\sqrt{32a^4b^5}$

$= \sqrt{16a^4b^4}\sqrt{2b}$

$= 4a^2b^2\sqrt{2b}$

8. $\sqrt[4]{48a^{12}b^6}$

$= \sqrt[4]{16a^{12}b^4}\sqrt[4]{3b^2}$

$= 2a^3b\sqrt[4]{3b^2}$

9. $\sqrt[3]{27x^9} = 3x^3$

Divide and Simplify.

10. $\dfrac{\sqrt{14a^{13}}}{\sqrt{2a^5}} = \sqrt{\dfrac{14a^{13}}{2a^5}} = \sqrt{7a^8}$

$= a^4\sqrt{7}$

11. $\dfrac{\sqrt[4]{32b^{20}}}{\sqrt[4]{2b^8}} = \sqrt[4]{\dfrac{32b^{20}}{2b^8}}$

$= \sqrt[4]{16b^{12}} = 2b^3$

Solving Radical Equations Unit 9 Day 6

Warmup:

Express the fraction $\dfrac{2x^{\frac{3}{2}}}{(16x^4)^{\frac{1}{4}}}$ in simplest radical form.

$$\frac{2x^{3/2}}{\sqrt[4]{16x^4}} = \frac{\cancel{2}x^{3/2}}{\cancel{2}x^1} = x^{1/2} = \sqrt{x}$$

Solving Radical Equations Unit 9 Day 6

Steps:

1. Isolate the expression containing the radical. (Be sure to have only one radical per side.)
2. Square both sides.
3. Solve the resulting equation.
4. Must Check (extraneous roots!) !!!!
   → check in the original equation
5. Write the solution set { }

Example:

$\left(\sqrt{2x+1}\right)^2 = (3)^2$

$2x+1 = 9$

$2x = 8$

$x = 4$

ck: $\sqrt{2(4)+1} = 3$

$\sqrt{9} = 3$

$3 = 3$ ✓

$\{4\}$

Solve and check.

1. $\left(\sqrt{x^2+7}\right)^2 = (x+1)^2$ $(x+1)(x+1)$ Double Dist!

$\cancel{x^2}+7 = \cancel{x^2}+2x+1$

$-\cancel{x^2} \quad -\cancel{x^2}$

$7 = 2x+1$

$6 = 2x$

$3 = x$

ck: $\sqrt{3^2+7} = 3+1$

$\sqrt{16} = 4$

$4 = 4$ ✓

$\{3\}$

2. $\sqrt{x+7} - 1 = x$

$\left(\sqrt{x+7}\right)^2 = (x+1)^2$ Double Dist!

$x+7 = x^2+2x+1$

$0 = x^2+x-6$

$0 = (x+3)(x-2)$

~~$x = -3$~~ reject | $x = 2$

ck $\sqrt{-3+7} - 1 = -3$

$\sqrt{4} - 1 = -3$

$2 - 1 = -3$

$1 \neq -3$

ck: $\sqrt{2+7} - 1 = 2$

$\sqrt{9} - 1 = 2$

$3 - 1 = 2$

$2 = 2$ ✓

$\{2\}$

$\left(\sqrt{3x-4}\right)^2 = \left(\sqrt{2x+3}\right)^2$

$3x-4 = 2x+3$

$x = 7$

ck: $\sqrt{3(7)-4} - \sqrt{2(7)+3} = 0$

$\sqrt{17} - \sqrt{17} = 0$

$0 = 0$ ✓

$\{7\}$

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

$\left(\sqrt{3x+13}\right)^2 = (x+5)^2$ Double Dist! $(x+5)(x+5)$

$3x+13 = x^2+10x+25$

$0 = x^2+7x+12$

$0 = (x+4)(x+3)$

$x=-4$	$x=-3$
ck $\sqrt{3(-4)+13} - 5 = -4$	ck: $\sqrt{3(-3)+13} - 5 = -3$
$\sqrt{1} - 5 = -4$	$\sqrt{4} - 5 = -3$
$1 - 5 = -4$	$2 - 5 = -3$
$-4 = -4$ ✓	$-3 = -3$ ✓

$\{-4, -3\}$

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

$(\sqrt{2x+1})^2 = (1-x)^2$ $\quad (1-x)(1-x)$

$1-x-x+x^2$

$2x+1 = 1-2x+x^2$

$0 = x^2-4x$

$0 = x(x-4)$

$x=0$	$\cancel{x=4}$
ck $\sqrt{2(0)+1}+0=1$	$\sqrt{2(4)+1}+4=1$
$\sqrt{1}+0=1$	$\sqrt{9}+4=1$
$1+0=1$	$3+4=1$
$1=1$	$7\neq1$

$\{0\}$

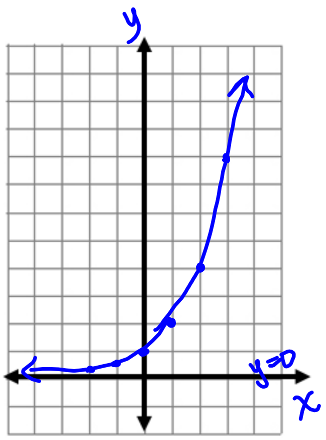
Exponential Growth & Decay Unit 9 Day 7

Exponential Function: $f(x) = b^x$

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

Graph $f(x) = 2^x$

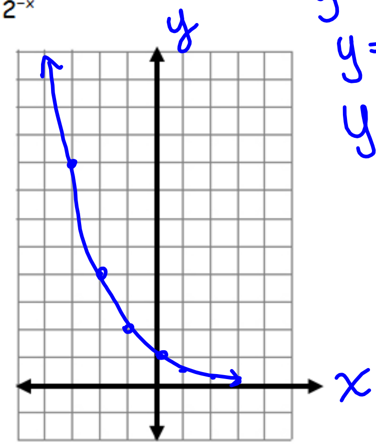
x	y
-2	1/4
-1	1/2
0	1
1	2
2	4



Exponential growth or decay?
(Circle One)
End Behavior:
$x \to -\infty \quad f(x) \to$ 0
$x \to \infty \quad f(x) \to$ ∞

Graph $f(x) = 2^{-x}$

x	y
-2	4
-1	2
0	1
1	1/2
2	1/4



Exponential growth or decay?
(Circle One)
End Behavior:
$x \to -\infty \quad f(x) \to$ ∞
$x \to \infty \quad f(x) \to$ 0

How can you tell from a given exponential function whether or not it will grow or decay?

look at Base. If base > 1 growth
base < 1 decay

Summary:

Point on every exponential graph: $(0,1)$

Domain: $(-\infty,\infty)$

Range: $(0,\infty)$

Quadrants: I, II

Asymptote(s)? x-axis $(y=0)$

Are exponential functions 1-1? How can you tell? What does this tell you about their inverses?