Name: KEY Hour: ____________ Date: ____________

NOTES: Section 6.1 – Evaluate *n*th Roots and Use Rational Exponents

Goals: #1 - I can interchange an expression between rational and radical notation, and evaluate the expression (using a calculator).

#2 - I can evaluate a rational or radical expression (without using a calculator).

#3 - I can solve equations using nth roots.

Homework: Lesson 6.1 Worksheet

Exploration #1: Work with a partner and answer the following questions.

1. Use a calculator to evaluate the following expressions.

a. $\sqrt{25} = 5$

b. $(25)^{1/2} = 5$

c. $(a^{1/3})^3 = a^1 = a$

d. $(x^{1/4})^4 = x^1 = x$

e. $\sqrt[3]{64} = 4$

f. $(64)^{1/3} = 4$

Notes:

There are two properties of rational (a/b) exponents:

- $a^{m/n} = (a^{1/n})^m = (\sqrt[n]{a})^m$
- $a^{-m/n} = \frac{1}{a^{m/n}} = \frac{1}{(a^{1/n})^m} = \frac{1}{(\sqrt[n]{a})^m}$

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Example #1: Rewrite the expression using rational exponent notation.

1. $\sqrt[4]{13}$

$\boxed{13^{1/4}}$

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

$\boxed{3^{1/7}}$

3. $(\sqrt[4]{11})^9$

$(11^{1/4})^9$

$\boxed{11^{9/4}}$

Example #2: Rewrite the expression using radical notation.

1. $9^{1/5}$

$\boxed{\sqrt[5]{9}}$

2. $12^{2/7}$

$\boxed{(\sqrt[7]{12})^2}$

3. $4^{3/4}$

$\boxed{(\sqrt[4]{4})^3}$

Example #3: Evaluate the expression without using a calculator.

1. $16^{3/2}$

$(\sqrt{16})^3$

$(4)^3$

$\boxed{64}$

2. $32^{-3/5}$

$(\sqrt[5]{32})^{-3}$

$(2)^{-3}$

$\frac{1}{2^3}$

$\boxed{\frac{1}{8}}$

3. $\sqrt[3]{-64}$

$\boxed{-4}$

You practice: Evaluate the expression without using a calculator.

1. $4^{5/2}$

$(\sqrt{4})^5$

$(2)^5$

$\boxed{32}$

2. $64^{-2/3}$

$(\sqrt[3]{64})^{-2}$

$(4)^{-2}$

$\frac{1}{4^{-2}}$

$\boxed{\frac{1}{16}}$

3. $(\sqrt[4]{16})^5$

$(2)^5$

$\boxed{32}$

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Example #4: Evaluate the expression using a calculator. Round answers to the nearest hundredth.

1. $(-9)^{1/5}$

$\boxed{-1.55}$

2. $12^{3/8}$

$\boxed{2.54}$

3. $(\sqrt[4]{7})^3$ $7^{3/4}$

$\boxed{4.3}$

You practice: Evaluate the expression using a calculator. Round answers to the nearest hundredth.

1. $4^{2/5}$

$\boxed{1.74}$

2. $64^{-2/3}$

$\boxed{0.06}$

3. $(\sqrt[3]{-30})^2$ $(-30)^{2/3}$

$\boxed{9.65}$

Notes:

The inverse opeartion of squaring a number is taking the square root of that number.

Similarily, the inverse opeartion of raising a number to the power of n is taking the n^{th} root of that number.

We use this idea to solve equations using n^{th} roots

Example #5: Solve the equation.

1. $\frac{4x^5}{4} = \frac{128}{4}$

$x^5 = 32$

$\sqrt[5]{x^5} = \sqrt[5]{32}$

$\boxed{x = 2}$

2. $(x-3)^4 = 21$

$\sqrt[4]{(x-3)^4} = \sqrt[4]{21} \to 21^{1/4}$

$x - 3 = \pm 2.14$

$+3 \quad +3$

$\boxed{x = 5.14,\ 0.86}$

You practice: Solve the equation.

$4\,1\left(\frac{1}{4}x^3\right) = (2)\,4$

$x^3 = 8$

$\sqrt[3]{x^3} = \sqrt[3]{8}$

$\boxed{x = 2}$

2. $(x+5)^4 = 16$

$\sqrt[4]{(x+5)} = \sqrt[4]{16}$

$x + 5 = \pm 2$

$-5 \quad -5$

$\boxed{x = -3, -7}$