

- Learning Target(s):** I am able to evaluate expressions with rational exponents.
 I am able to approximate roots with a calculator.
 I am able to solve equations using nth roots.

Notes: 6.1 Evaluate nth roots and Use Rational Exponents

nth root of a – for an integer n greater than 1, if $b^n = a$ then b is an nth root of a.

Index of a radical – an nth root of a is written as $\sqrt[n]{a}$ where n is the index of the radical.

****odd root of a negative #** - you get a negative answer.

Ex: $\sqrt[3]{-8} = -2$ 3 is root; 3 is odd

****even root of a negative #** - you do not get any real solutions.

Ex: $\sqrt[4]{-16} = \text{no real solutions}$

**** when you take an even root you need to remember \pm**

Ex 1: Find the indicated real nth root(s) of a.

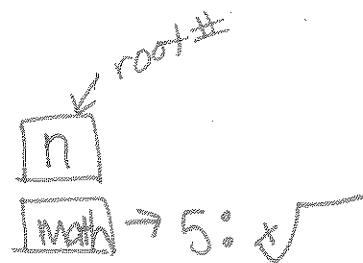
a. $n = 3, a = -64$

$$\sqrt[3]{-64} = -4$$

b. $n = 6, a = 729$

$$\sqrt[6]{729} = \pm 3$$

even root



POWER
Root
fraction
Rational Exponent

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

Ex 2: Evaluate $8^{-4/3}$

negative exponent

Go all the way
 • no decimals
 • no negative exponents

$$\frac{1}{8^{4/3}} = \frac{1}{(\sqrt[3]{8})^4}$$

$$= \frac{1}{2^4} = \frac{1}{16}$$

Ex 3: Solve the following equations using nth roots. Round to the nearest hundredth.

a. $\frac{2x^6}{2} = \frac{1458}{2}$

$$\sqrt[6]{x^6} = \sqrt[6]{729}$$

$$x = \pm 3$$

b. $\sqrt[3]{(x+4)^3} = \sqrt[3]{12}$

$$x+4 = \sqrt[3]{12}$$

$$-4 \qquad -4$$

$$x = \sqrt[3]{12} - 4$$

$$x = -1.71$$

Try it!

Write each expression in radical form.

1) $7^{\frac{1}{2}} = (\sqrt{7})^1$

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

3) $2^{\frac{5}{3}}$

4) $7^{\frac{4}{3}}$

5) $6^{\frac{3}{2}}$

6) $2^{\frac{1}{6}}$

13) $(5x)^{-\frac{5}{4}}$

14) $(5x)^{\frac{1}{2}}$

15) $(10n)^{\frac{3}{2}}$

16) $a^{\frac{6}{5}}$

Write each expression in exponential form.

7) $(\sqrt[4]{10})^3 = 10^{\frac{3}{2}}$

8) $\sqrt[6]{2}$

9) $(\sqrt[4]{2})^5$

10) $(\sqrt[4]{5})^5$

11) $\sqrt[3]{2}$

12) $\sqrt[6]{10}$

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

20) $(\sqrt[3]{6x})^4$

21) $\sqrt[4]{v}$

22) $\sqrt{6p}$