Announcements:
1. The Chapter 6 Lab Activity is due this Saturday at 9 pm.
2. Watch for Atlas/Canvas communication from me in the next few days regarding earning a retake of the Chapter 6 Test.

$\sqrt{31}$ - Radicals and Radical Functions (p. 93-77)

5.3.1 - Radicals and Radical Functions

$\sqrt{25} = 12...$

means non-terminating (polar even)
non-repeating (if there's no pattern)

$\sqrt[3]{16} = 2$

$\sqrt[4]{144} = 12$

$\sqrt[-1]{8} = -2$

Find: $\sqrt{16} = -2$

Find: $\sqrt[4]{-16} = \text{non-real number}$

It's not possible to multiply an even number of times and have a negative in the answer.
* Announcements:
  1. The Chapter 6 Lab Activity is due this Saturday at 3pm.
  2. Watch for Atlas/Canvas communication from me in the next few days regarding earning a retake at the Chapter 6 Test.

* §7.1 - Radicals and Radical Functions (pp 93-77)

§7.1 - Radicals and Radical Functions p. 93

\[ \sqrt{5} \approx 2.2 \ldots \]

- means non-terminating (never ends), non-repeating (no pattern)

7.1.29, 7.1.1, and 7.1.23

\[ \sqrt{16} = 4 \] means \[ 4 \cdot 4 = 16 \]

\[ \sqrt{144} = 12 \] means \[ 12 \cdot 12 = 144 \]

\[ \sqrt{8} = -2 \] means \[ -2 \cdot -2 \cdot -2 = -8 \]

It's not possible to multiply an even number of times and have a negative in the answer.

\[ \sqrt{-16} \]

Find \[ \sqrt{-16} = \text{non-real number} \]

\[ \sqrt{-16} \rightarrow \Delta \cdot \Delta \cdot \Delta \cdot \Delta = -16 \]
\[ \sqrt[3]{-243} = -3 \]

Notice: \( \sqrt[3]{16} \neq \sqrt[16]{16} \)

- Answer: \(-2\)
- Not a real number

\[ \begin{align*}
\text{Obs.:} & \\
\sqrt{+\#} & \rightarrow +\# \\
\sqrt{-\#} & \rightarrow \begin{cases} 
-\# \rightarrow \text{if index is odd} \\
\text{non-real} \rightarrow \text{if index is even}
\end{cases}
\end{align*} \]

7.1.13

(a) positive
(b) negative
(c) not a real number
(d) not a real number
(e) negative

So:

- An odd root of a negative is negative
- An even root of a negative is non-real
- An odd root of a positive is positive
- An even root of a positive is positive

Obs.: Any root of a positive is positive
3.11 Prime factorization of: \(220 \times y^3\) = 2, 3, 11, 5, x, x, y, y, y.

3.16 \(\sqrt{16 \times x^6}\) = 2, 2, x, x, x.

3.41 \(\sqrt[3]{256 \times 5^5}\) = 2, 2, 2, 2, 2, x, x, x, x, x.
7.1.2 \[ \sqrt{16 + x^2} = \text{cannot be simplified} \]

7.1.67 \[ \sqrt{243x^{10}y^5} = \sqrt{-3 \cdot -3 \cdot -3 \cdot -3 \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y} \]

\[ = -3x^5y \]

\[ = \left[-3x^2y\right] \]

\[ \text{final answer} \]

For shortcut for the variables:

- divide the exponent of each variable by the index of the radical. If there's a remainder in this division, leave this number as the exponent of each variable inside the variable.

**Example:**

\[ \sqrt{a^{33} b^{43} c^{33}} \]

\[ = a^{33/5} b^{43/5} c^{33/5} \]

\[ \sqrt{3} \]

\[ = \left[3^{1/5}\right] \]

\[ = \left[3\right] \]

\[ = 3 \]

\[ \text{final answer} \]

7.3.53 \[ - \sqrt{498x^6y^{15}} \]

\[ = -\sqrt{2^2 \cdot 2 \cdot 2 \cdot 2 \cdot 7 \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y} \]

\[ = -2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y \]

\[ \text{final answer} \]
\( \sqrt{\text{principal square root}} \), and indicates the positive number only.

So, the principal square root only considers the positive number.

So, the rule is:

\[
\begin{align*}
\text{if your variable could be negative and} \\
\text{your index is even, then you need} \\
\text{absolute value bars!}
\end{align*}
\]