

**Roots and Radical Expressions**

$n^{\text{th}}$  root      if  $a^n = b$  then  $a$  is the  $n^{\text{th}}$  root of  $b$

$a = \sqrt[n]{b}$ ,  $n$  is called the index and  $b$  is the radicand

$2^4 = 16$       so 2 is a 4<sup>th</sup> root of 16

$(-2)^4 = 16$       so  $-2$  is a 4<sup>th</sup> root of 16

<u>Type of number</u>	<u>Number of real <math>n^{\text{th}}</math> roots when <math>n</math> is even</u>	<u>Number of real <math>n^{\text{th}}</math> roots when <math>n</math> is odd</u>
Positive	2	1
0	1	1
Negative	0	1

Ex: Find all the real roots

The cube roots of 0.027

The cube roots of  $-125$

The cube roots of  $\frac{1}{64}$

The fourth roots of 625

The fourth roots of  $-0.0016$

The fourth roots of  $\frac{81}{625}$

## Finding Real Roots

$$\sqrt[3]{-1000}$$

$$\sqrt{0.49}$$

$$\sqrt{-81}$$

$n^{\text{th}}$  root of  $a^n$        $a < 0$

$\sqrt[n]{a^n} =  a  \text{ when } n \text{ is even (use the even, even, odd rule)}$
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Ex:  $\sqrt{9x^{10}}$

Ex:  $\sqrt[3]{a^3b^6}$

Ex:  $\sqrt[4]{x^{16}y^4}$

## Adding and Subtracting Radical Expressions

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**Like Radicals** – radicals with the same index and same radicand

Examples:

$$5\sqrt[3]{x} + 7\sqrt[3]{x}$$

$$7\sqrt{xy} + \sqrt{xy}$$

$$2\sqrt[3]{x} - 2\sqrt[3]{5}$$

$$16\sqrt{x} + 8\sqrt[3]{x}$$

**Simplify** before adding or subtracting radicals so you can find all the like radicals

$$3\sqrt{20} - \sqrt{45} + 4\sqrt{80}$$

**Add or subtract if possible.**

1.  $6\sqrt[3]{3} - 2\sqrt[3]{3}$

2.  $7\sqrt{2} + 7\sqrt{3}$

3.  $14\sqrt{20} - 3\sqrt{125}$