Roots & Exponents

	Even roots			Odd roots		
	$\sqrt{a}$	$\sqrt[4]{a}$	$\sqrt[6]{a}$	$\sqrt[3]{a}$	$\sqrt[5]{a}$	$\sqrt[7]{a}$
$a < 0$	No real roots			One real n^{th} root		
$a = 0$	One real n^{th} root			One real n^{th} root		
$a > 0$	Two real n^{th} roots			One real n^{th} root		

$\sqrt[2]{64} = 8, -8$ $= \pm 8$ $\quad \sqrt[3]{64} = 4 \quad \sqrt[5]{32} = 2$

$\sqrt[5]{-32} = -2 \quad \sqrt[4]{16} = 2, -2 \quad \sqrt[4]{-16}$ No real # roots

Rational Exponents

$\sqrt[3]{64} = 64^{\frac{1}{3}}$ $\quad 64 \wedge (1/3)$ $\quad \sqrt[3]{a} = a^{\frac{1}{3}}$

$\sqrt[5]{a} = a^{\frac{1}{5}} \quad \sqrt[5]{a^2} = a^{\frac{2}{5}}$ (2 → exponent, 5 → root)

$$a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$$

Example:

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

$= 2^4 = 16$

$7^{\frac{5}{2}} = \sqrt{7^5} = (\sqrt{7})^5$