

1.  $a^m a^n = a^{m+n}$
2.  $(a^m)^n = a^{mn}$
3.  $(ab)^m = a^m b^m$  (leads to  $\sqrt[n]{ab} = \sqrt[n]{a} \sqrt[n]{b}$ )
4.  $a^{-m} = \frac{1}{a^m}$
5.  $\frac{a^m}{a^n} = a^{m-n}$
6.  $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$  (leads to  $\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$ )
7.  $\sqrt{a} = a^{\frac{1}{2}}$
8.  $\sqrt[n]{a} = a^{\frac{1}{n}}$
9.  $\sqrt[n]{a^m} = (\sqrt[n]{a})^m = a^{\frac{m}{n}}$

Not exponent properties, but useful:

1.  $\frac{ab}{ac} = \frac{b}{c}$  (simplifying fractions)
2.  $\frac{a}{c} + \frac{b}{c} = \frac{a+b}{c}$  (adding fractions)
3.  $\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$  (multiplying fractions)

The following inequalities represent things that students sometimes erroneously think should be equal, but are usually not equal. I am intentionally misusing the  $\neq$  sign here to mean “is *usually* not equal to,” when it actually means “is not equal to.”

1.  $\frac{a+b}{a+c} \neq \frac{b}{c}$
2.  $(a+b)^m \neq a^m + b^m$
3.  $a^{-m} \neq -a^m$

Here are some tips and tricks.

1. Using some of the properties above, we see that  $a^{\frac{m}{n}} = a^{m \cdot \frac{1}{n}} = (a^m)^{\frac{1}{n}} = \sqrt[n]{a^m}$ . Similarly,  $a^{\frac{m}{n}} = a^{\frac{1}{n} \cdot m} = (a^{\frac{1}{n}})^m = (\sqrt[n]{a})^m$ .
2. To add fractions, factor to find a lowest common denominator and then multiply the fractions by different forms of 1 to get common denominators.