Properties for Expressions:
$x = 1x \qquad -x = -1x$
$nx = \underbrace{x + \cdots + x}_{n-many\ times}$
$x - x = 0$
$a - b = a + -b$
Multiple instances of addition can be performed in any order. For example: $a + b = b + a \qquad (a + b) + c = a + b + c \qquad a + (b + c) = a + b + c$
Multiple instances of multiplication can be performed in any order. For example: $ab = ba \qquad (ab)c = abc \qquad a(bc) = abc$
$a(b + c) = ab + ac \qquad (a + b)c = ac + bc$ $a(x_1 + \cdots + x_n) = ax_1 + \cdots + ax_n \qquad (x_1 + \cdots + x_n)c = x_1c + \cdots + x_nc$
$x^n = \underbrace{x \cdot \ldots \cdot x}_{n-many\ times}$
$x^{-n} = \frac{1}{x^n} \quad (whenever\ x \neq 0)$
$\frac{x}{1} = x$
$\frac{x}{x} = 1 \quad (whenever\ x \neq 0)$
$\frac{ab}{cd} = \frac{a}{c} \cdot \frac{b}{d} \quad (whenever\ c, d \neq 0) \qquad \frac{x_1 \cdot \ldots \cdot x_n}{y_1 \cdot \ldots \cdot y_n} = \frac{x_1}{y_1} \cdot \ldots \cdot \frac{x_n}{y_n} \quad (whenever\ y_1, \ldots, y_n \neq 0)$
$\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c} \quad (whenever\ c \neq 0) \qquad \frac{x_1 + \cdots + x_n}{y} = \frac{x_1}{y} + \cdots + \frac{x_n}{y} \quad (whenever\ y \neq 0)$
$\sqrt[n]{x^n} = \begin{cases} x & if\ n\ is\ odd\ \ or\ \ x \geq 0 \\ -x & if\ n\ is\ even\ and\ \ x < 0 \end{cases}$
$\sqrt[n]{ab} = \sqrt[n]{a}\sqrt[n]{b}$ for example, $\sqrt{x} \cdot \sqrt{x} = \sqrt{x \cdot x} = \sqrt{x^2}$
$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}} \quad (whenver\ b \neq 0)$
$ax^2 + bx + c = ax^2 + b_1x + b_2x + c$ for example, $a^2 - b^2 = a^2 + ab - ab - b^2$ $whenever \begin{array}{l} * b_1, b_2\ are\ whole\ numbers \\ * b_1 \cdot b_2 = ac \\ * b_1 + b_2 = b \end{array}$ This allows us to then factor by grouping.
$\log_b(a) = c \leftrightarrow b^c = a \quad (whenver\ a \neq 0)$

These properties can be derived from the ones on the previous page and/or the definitions:	
$x^a x^b = x^{a+b}$ $\log_b(xy) = +\log_b(y) \quad (x, y \neq 0)$	$\frac{x^a}{x^b} = x^{a-b}$ $\log_b\left(\frac{x}{y}\right) = \log_b(x) - \log_b(y) \quad (x, y \neq 0)$
$(x^a)^b = x^{ab}$	$\log_b(x^y) = y \cdot \log_b(x) \quad (x \neq 0)$
$\log_b(x) = \frac{\log_c(x)}{\log_c(b)}$	

Rules for rewriting trigonometric expressions and for solving equations are not listed here at present.

Properties that apply to equations specifically:	
$a = b \leftrightarrow b = a$	
$a = b \leftrightarrow a + c = b + c$	$a < b \leftrightarrow a + c < b + c$
$a = b \leftrightarrow a \cdot c = b \cdot c \quad (whenever\ c \neq 0)$	$a < b \leftrightarrow \begin{cases} a \cdot c < b \cdot c & if\ c > 0 \\ a \cdot c > b \cdot c & if\ c < 0 \end{cases}$
$a = b \leftrightarrow \frac{a}{c} = \frac{b}{c} \quad (whenever\ c \neq 0)$	$a < b \leftrightarrow \begin{cases} \frac{a}{c} < \frac{b}{c} & if\ c > 0 \\ \frac{a}{c} > \frac{b}{c} & if\ c < 0 \end{cases}$
$a = b\ and\ c = d \leftrightarrow a + c = b + d$	$a = b\ and\ c = d \leftrightarrow na + mc = nb + md$ $for\ any\ numbers\ n\ and\ m$
$ab = 0 \leftrightarrow a = 0\ or\ b = 0$	