$$\frac{a}{c}+\frac{b}{c}=\frac{a+b}{c} \qquad \frac{a}{c}+\frac{b}{d}=\frac{ad+bc}{cd} \qquad \frac{a}{c}\cdot\frac{b}{d}=\frac{ab}{cd}$$

$$\frac{a}{c}\div\frac{b}{d}=\frac{a}{c}\cdot\frac{d}{b}=\frac{ad}{cb} \qquad \frac{a}{b}=\frac{c}{d} \iff a=\frac{bc}{d} \iff ad=bc$$

$a^0=1$	$\sqrt{xy}=\sqrt{x}\sqrt{y}$
$a^m\cdot a^n=a^{m+n}$	$\sqrt{\frac{x}{y}}=\frac{\sqrt{x}}{\sqrt{y}}$
$\left(a^m\right)^n=a^{mn}$	$\sqrt[n]{x}=x^{\frac{1}{n}}$
$\frac{a^m}{a^n}=a^{m-n}$	$\sqrt[n]{x^m}=x^{\frac{m}{n}}$
$a^{-n}=\frac{1}{a^n}$	
$(ab)^m=a^mb^m$	
$\left(\frac{a}{b}\right)^m=\frac{a^m}{b^m}$	

$$(a-b)(a+b)=a^2-b^2 \qquad a^2-2ab+b^2=(a-b)^2$$

$$\left(\sqrt{a}-\sqrt{b}\right)\left(\sqrt{a}+\sqrt{b}\right)=a-b \qquad a^2+2ab+b^2=(a+b)^2$$

$$(a-b)^2=a^2-2ab+b^2 \qquad a^2-b^2=(a-b)(a+b)$$

$$(a+b)^2=a^2+2ab+b^2 \qquad a^3-b^3=(a-b)\left(a^2+ab+b^2\right)$$

$$(a-b)^3=a^3-3a^2b+3ab^2-b^3 \qquad a^3+b^3=(a+b)\left(a^2-ab+b^2\right)$$

$$(a+b)^3=a^3+3a^2b+3ab^2+b^3 \qquad x^2+(a+b)+ab=(x+a)(x+b)$$

$$ax^2+bx+c=0 \quad \Rightarrow \quad x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$$

$e^x e^y = e^{x+y}$ $\quad \frac{e^x}{e^y} = e^{x-y}$ $\quad e^0 = 1 \;\; e^1 = 2.7183$

$\log_b 1 = 0$ $\quad \log_a a = 1$ $\quad \log_b b^x = x$

$a^{\log_a x} = x$ $\quad \ln e = 1$ $\quad \ln 1 = 0$

$y = \log_b x \iff x = b^y$

$a^x = a^y \Leftrightarrow x = y$

$\log_b M = \frac{\log_a M}{\log_a b} \qquad \Rightarrow \log_b M = \frac{\log M}{\log b} = \frac{\ln M}{\ln b}$

Product Rule: $\log_b MN = \log_b M + \log_b N$

Power Rule: $\log_b M^p = p \log_b M$

Quotient Rule: $\log_b \frac{M}{N} = \log_b M - \log_b N$