$$\frac{a}{c}+\frac{b}{c}=\frac{a+b}{c}$$

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

$$\frac{a}{c}\bullet\frac{b}{d}=\frac{ab}{cd}$$

$$\frac{a}{c}\div\frac{b}{d}=\frac{a}{c}\bullet\frac{d}{b}=\frac{ad}{cb}$$

$$\frac{a}{b}=\frac{c}{d}\quad\Leftrightarrow\quad a=\frac{bc}{d}\quad\Leftrightarrow\quad ad=bc$$

$$a^0=1$$

$$a^m\cdot a^n=a^{m+n}$$

$$\left(a^m\right)^n=a^{mn}$$

$$\frac{a^m}{a^n}=a^{m-n}$$

$$a^{-n}=\frac{1}{a^n}$$

$$(ab)^m=a^m b^m$$

$$\left(\frac{a}{b}\right)^m=\frac{a^m}{b^m}$$

$$\sqrt{xy}=\sqrt{x}\sqrt{y}$$

$$\sqrt{\frac{x}{y}}=\frac{\sqrt{x}}{\sqrt{y}}$$

$$\sqrt[n]{x}=x^{\frac{1}{n}}$$

$$\sqrt[n]{x^m}=x^{\frac{m}{n}}$$

$$(a-b)(a+b)=a^2-b^2$$

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

$$(a+b)^2=a^2+2ab+b^2$$

$$(a-b)^3=a^3-3a^2b+3ab^2-b^3$$

$$(a+b)^3=a^3+3a^2b+3ab^2+b^3$$

$$x^2+(a+b)+ab=(x+a)(x+b)$$

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

$$a^2+2ab+b^2=(a+b)^2$$

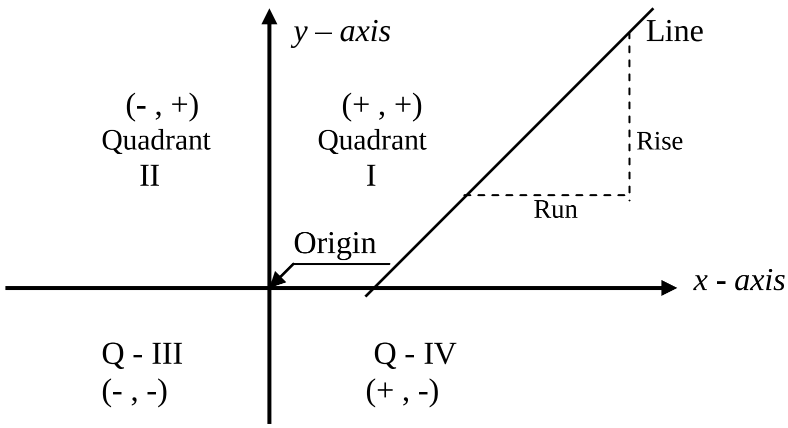
$$a^2-b^2=(a-b)(a+b)$$

$$a^2+b^2=(a-ib)(a+ib)$$

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

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

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



$$Slope = m = \frac{Vertical\ Change}{\text{Horizontal Change}} = \frac{Rise}{Run} = \frac{y_2 - y_1}{x_2 - x_1}$$

Equation of a line: $y = mx + b$ (***b***: y - intercept)

$y - y_1 = m(x - x_1)$ (*Given:* **slope and one point**)

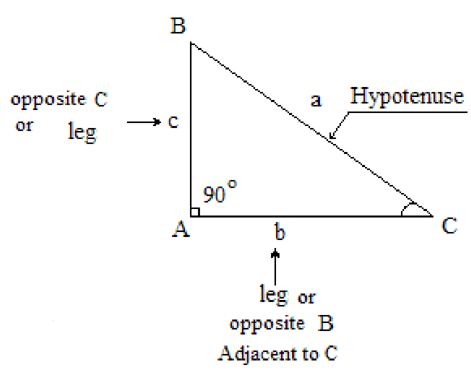
$\frac{y - y_2}{y_1 - y_2} = \frac{x - x_2}{x_1 - x_2}$ (*Given:* **2 points**)

Two slopes m_1 and m_2 are: Parallel (//) if $m_1 = m_2$

Perpendicular (⊥) $m_1 \cdot m_2 = -1$

Right Triangle:

Pythagorean Theorem: $a^2 = b^2 + c^2$



Two points $\left(x_1, y_1\right)$ and $\left(x_2, y_2\right)$

Distance between 2 points: d = $\sqrt{\left(x_2 - x_1\right)^2 + \left(y_2 - y_1\right)^2}$

Midpoint = $\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2}\right)$

Equation of a circle with a center (h, k) and radius r:

$$(x-h)^2 + (y-k)^2 = r^2$$

(Diameter = 2.r)

$$\begin{cases} |a| > 1 & \Rightarrow \textit{Stretching Vertically} \\ 0 < |a| < 1 & \Rightarrow \textit{Shrinking Vertically} \end{cases}$$

Reflected across x-axis

$$\begin{cases} |c| > 1 & \Rightarrow \textit{Shrinking Horizontally} \\ 0 < |c| < 1 & \Rightarrow \textit{Stretching Horizontally} \end{cases}$$

$$\boldsymbol{y = -\ a\, f(-\ c\ (x\ \pm\ b))\ \ \pm\ d}$$

Reflected across y-axis

$$\begin{cases} +b & \textit{Shifted Left} \\ -b & \textit{Shifted Right} \end{cases} \qquad \begin{cases} +d & \textit{Shifted up} \\ -d & \textit{Shifted Down} \end{cases}$$

$e^x e^y = e^{x+y}$

$\dfrac{e^x}{e^y} = e^{x-y}$

$e^0 = 1$

$e^1 = 2.7183$

$\log_b 1 = 0$

$\log_a a = 1$

$\log_b b^x = x$

$a^{\log_a x} = x$

$\ln e = 1$

$\ln 1 = 0$

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

$a^x = a^y \iff x = y$

$\log_b M = \dfrac{\log_a M}{\log_a b} \quad \Rightarrow \log_b M = \dfrac{\log M}{\log b} = \dfrac{\ln M}{\ln b}$

$\log_b MN = \log_b M + \log_b N$

$\log_b M^p = p \log_b M$

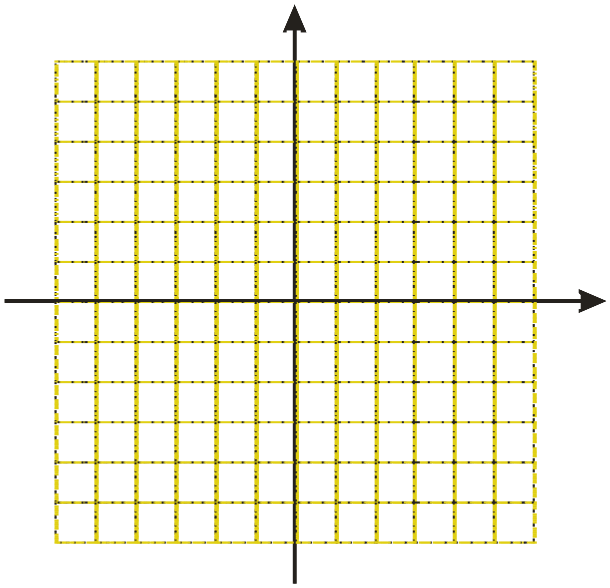
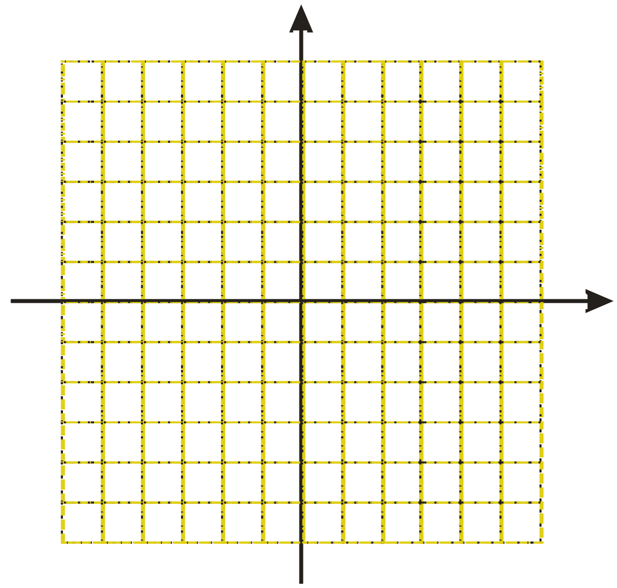
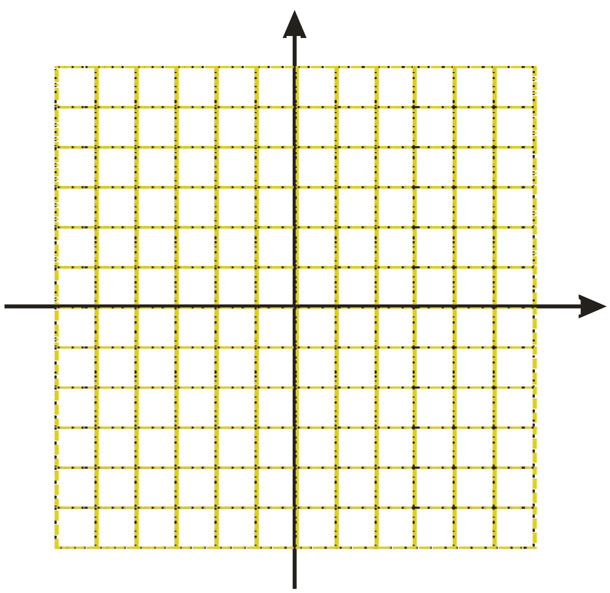
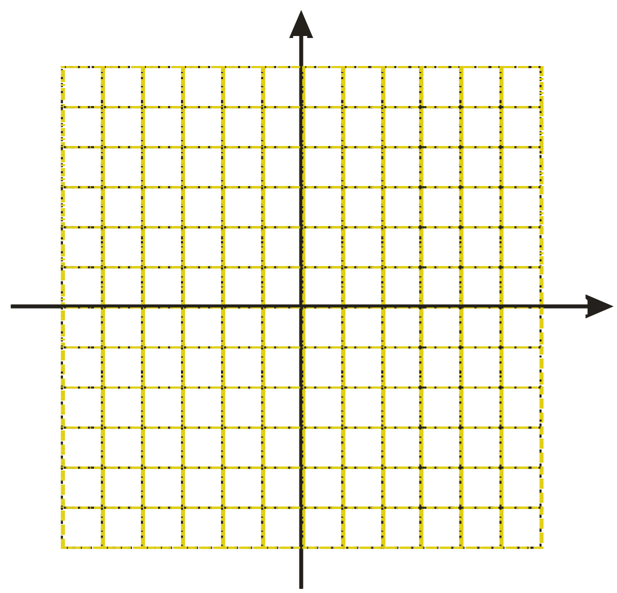
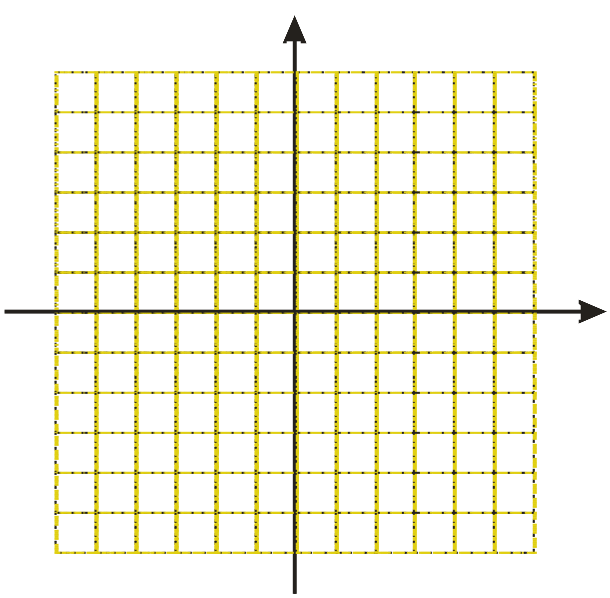
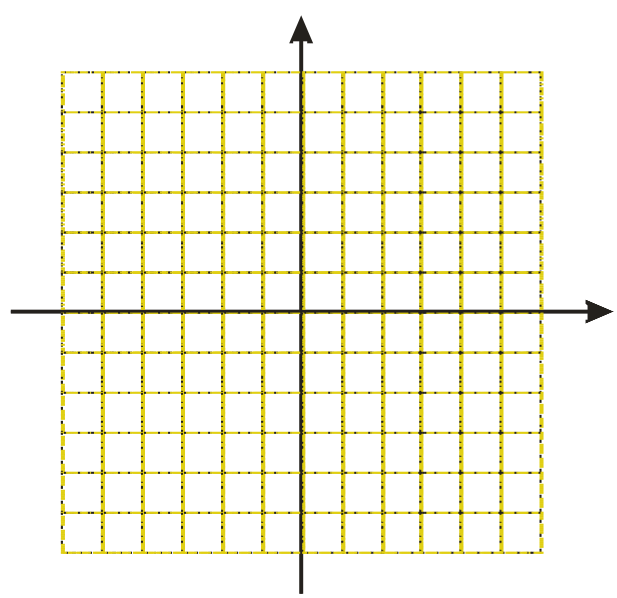
$\log_b \dfrac{M}{N} = \log_b M - \log_b N$

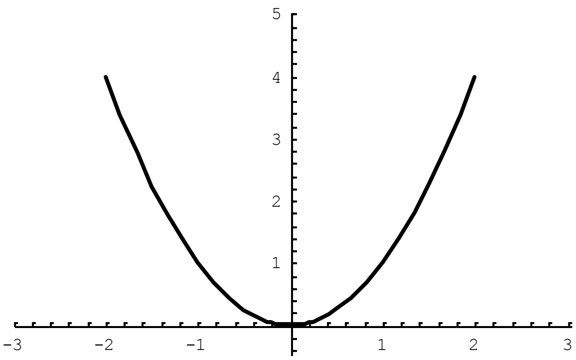
Formula

Exponential Growth / Decay: $P(t) = P_o\, e^{kt}$

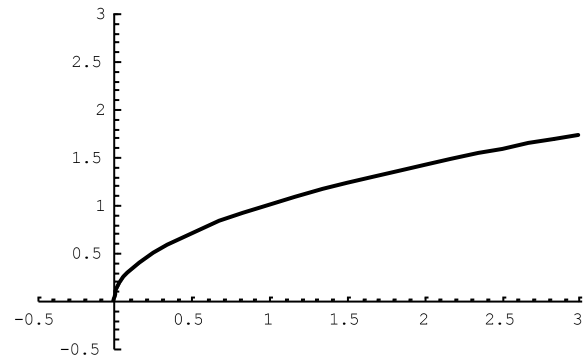
Growth Rate and Doubling Time: $kT = \ln 2$ $\quad k = \dfrac{\ln 2}{T}$ $\quad T = \dfrac{\ln 2}{k}$

Logistic Function: $P(t) = \dfrac{a}{1 + be^{-kt}}$

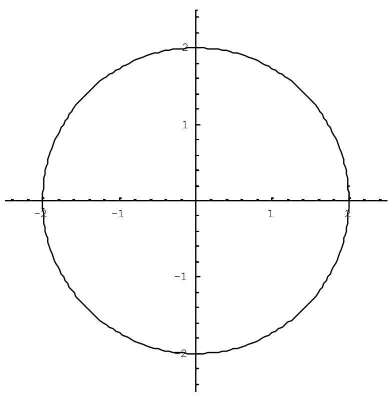









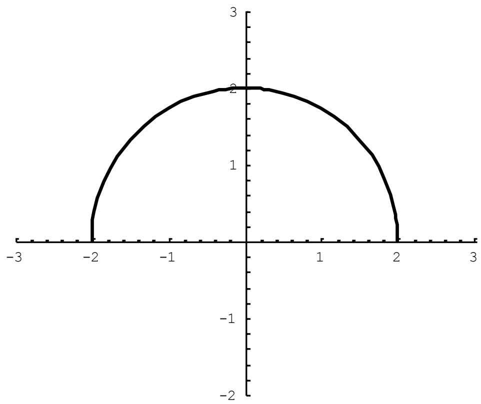
$y = x^2$



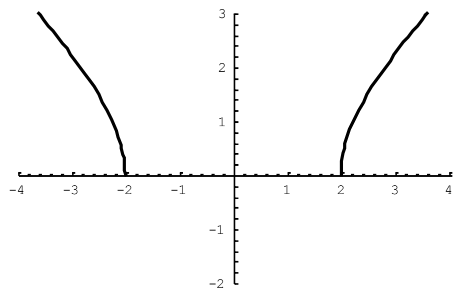
$y = \sqrt{x}$



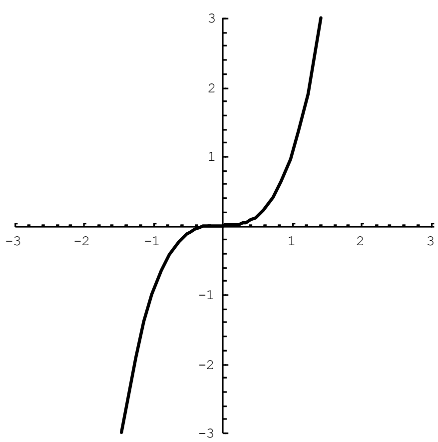
$y^2 + x^2 = 4$



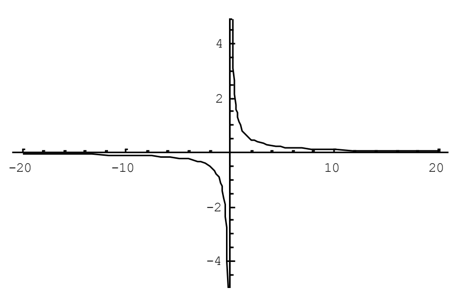
$y = \sqrt{4 - x^2}$



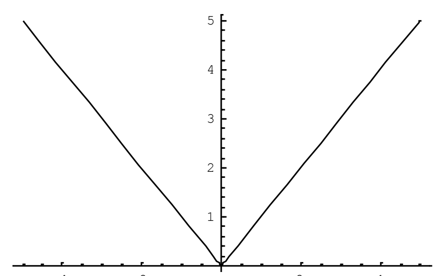
$y = \sqrt{x^2 - 4}$



$y = x^3$



$y = \dfrac{1}{x}$



$y = |x|$