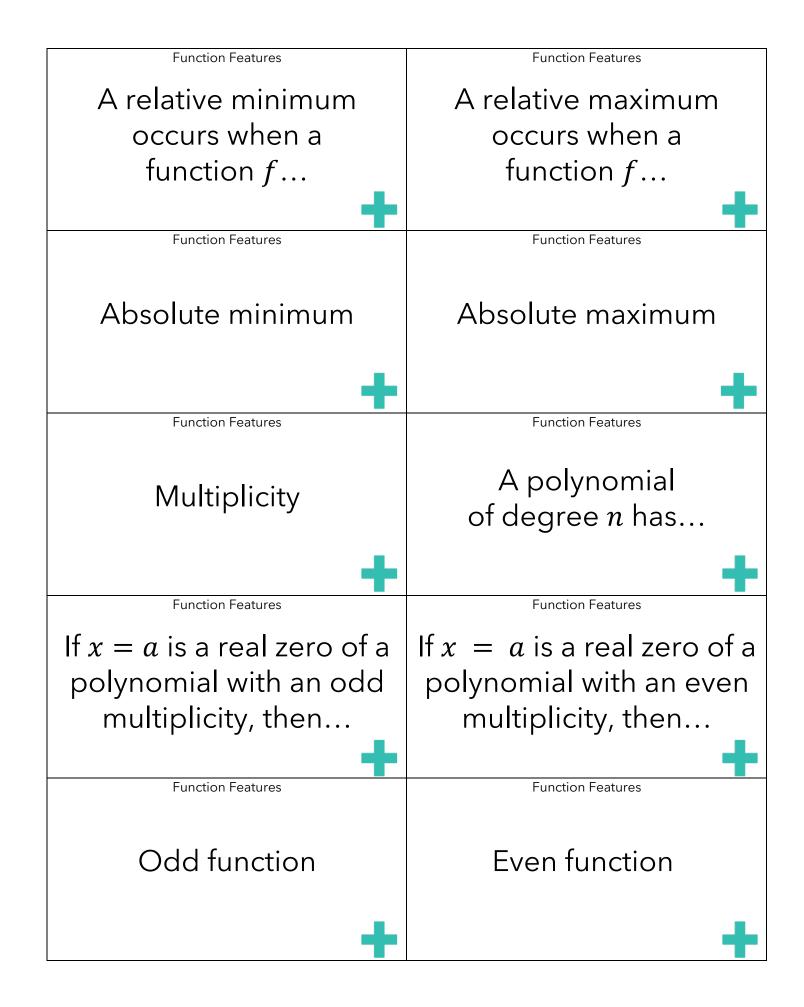
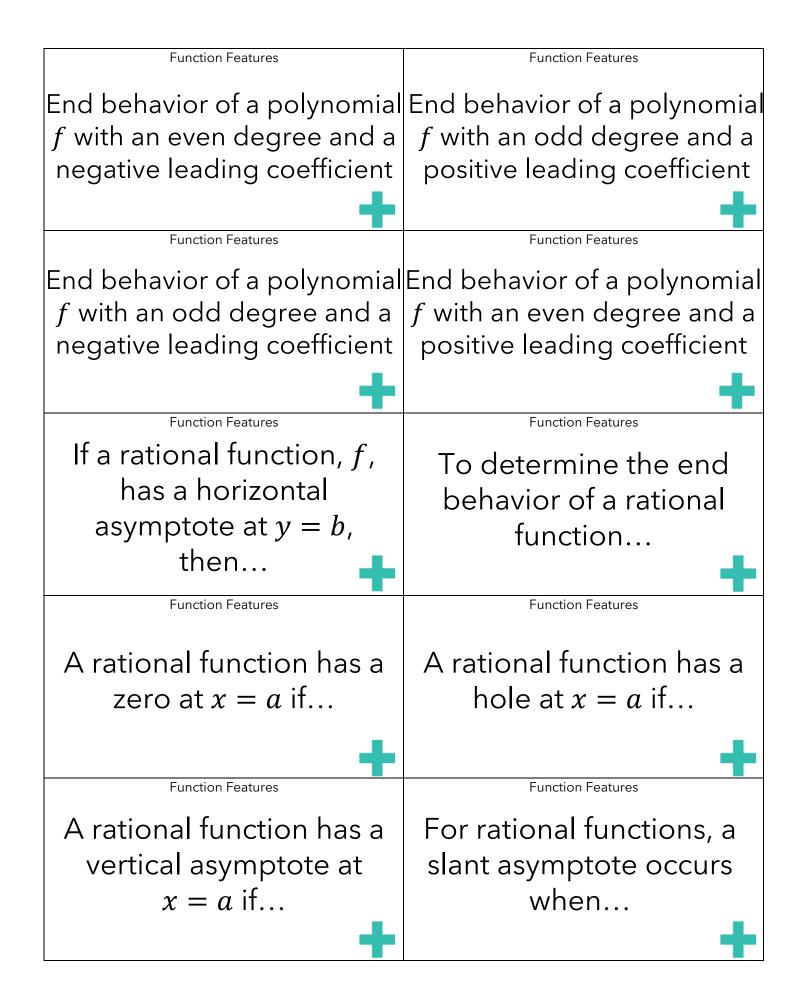


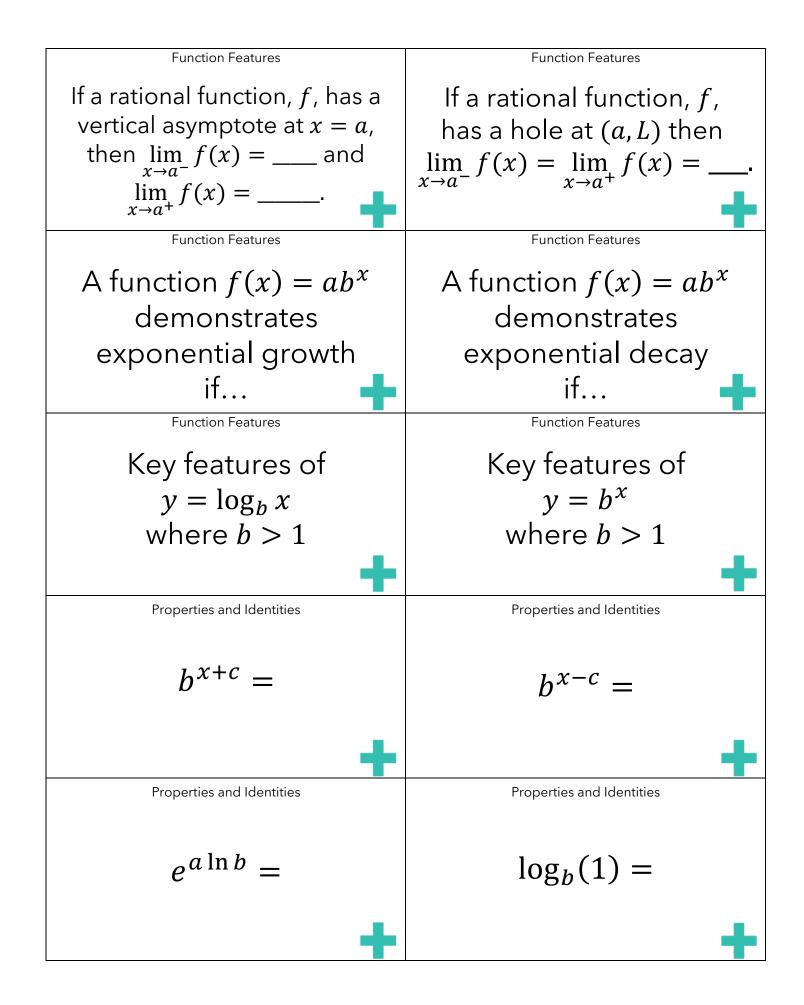
The rates of change of <i>f</i> are decreasing	The rates of change of <i>f</i> are increasing
As the input values increase, the output values always decrease. OR For all a and b in the interval, if $a < b$, then $f(a) > f(b)$.	As the input values increase, the output values always increase. OR For all a and b in the interval, if $a < b$, then $f(a) < f(b)$.
The rate of change of the function at that input	$\frac{f(b) - f(a)}{b - a}$
Decreasing	Increasing
Function where each input has a unique output (no repeated outputs)	Point on the graph of a function where the concavity changes, indicating a maximum or minimum rate of change



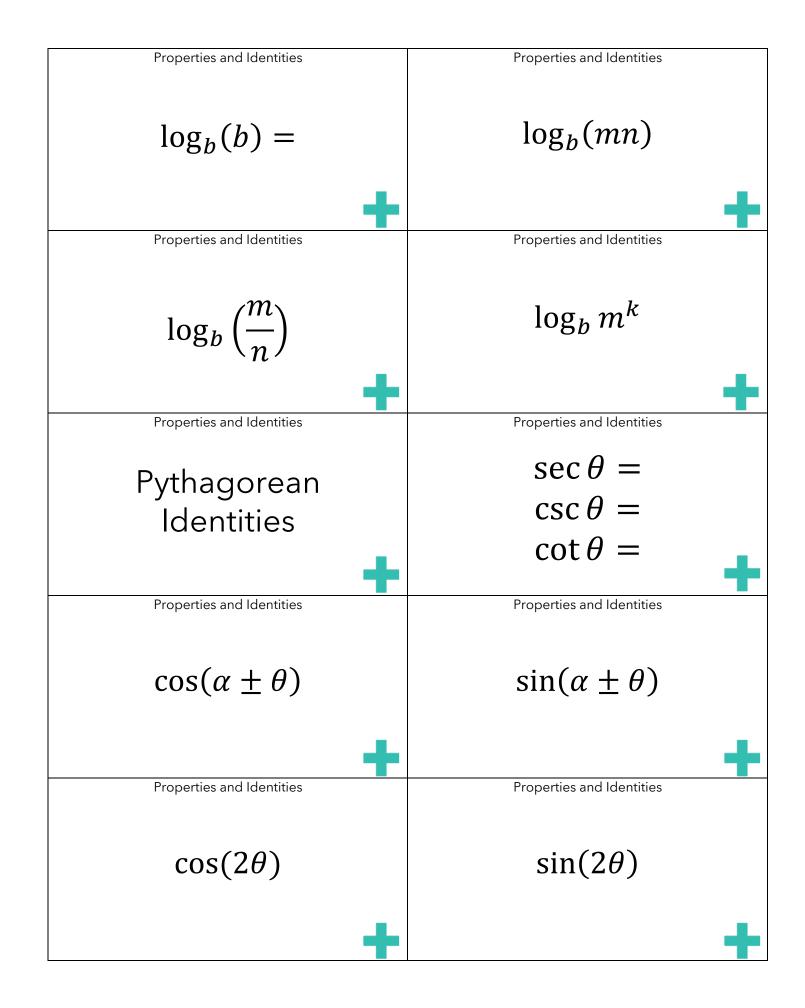
Changes from increasing	Changes from decreasing
to decreasing	to increasing
The greatest output	The least output
of a function	of a function
 Exactly n complex zeros	The number of times a
(real or imaginary) Constant nth	factor occurs in a
differences At most n – 1 extrema	polynomial function
The graph of the polynomial is tangent to the x -axis at $x = a$.	The graph of the polynomial passes through the x -axis at $x = a$.
f(-x) = f(x)	f(-x) = -f(x)



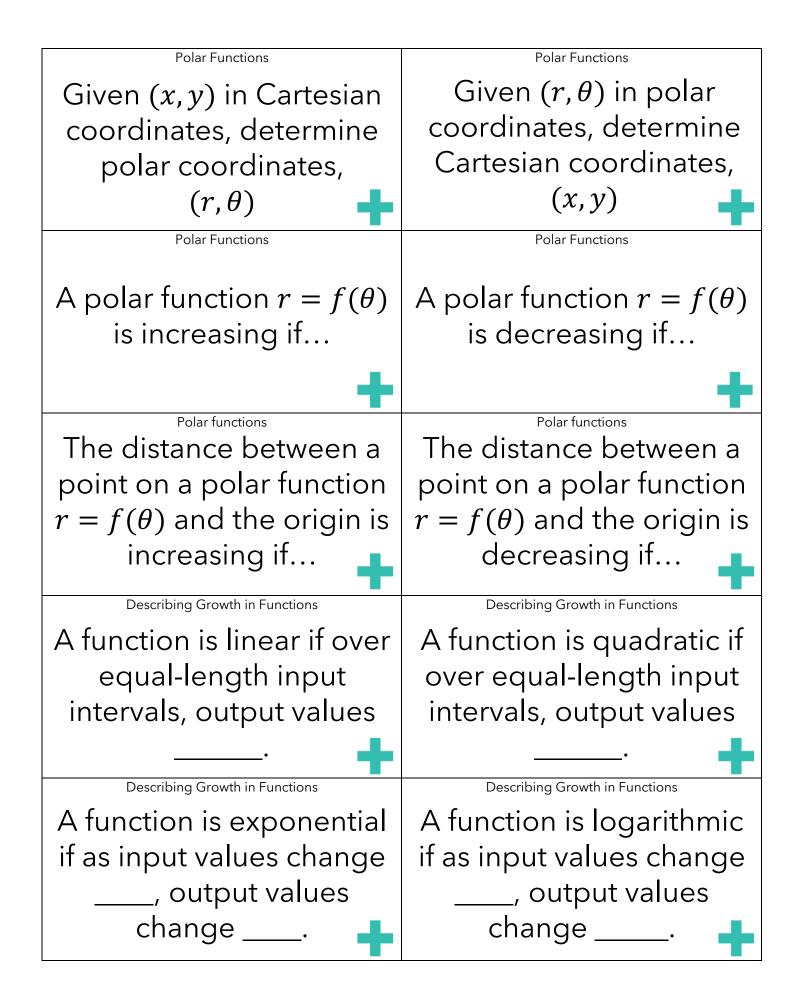
$\lim_{\substack{x \to \infty} f(x) = \infty} f(x) = -\infty$ $\lim_{x \to -\infty} f(x) = -\infty$	$\lim_{\substack{x \to \infty} f(x) = -\infty} f(x) = -\infty$ $\lim_{x \to -\infty} f(x) = -\infty$
$\lim_{\substack{x \to \infty}} f(x) = \infty$ $\lim_{x \to -\infty} f(x) = \infty$	$\lim_{x \to \infty} f(x) = -\infty$ $\lim_{x \to -\infty} f(x) = \infty$
Analyze the ratio of leading terms	The ratio of leading terms is a constant, b, $\lim_{x\to\infty} f(x) = b, \text{ and}$ $\lim_{x\to-\infty} f(x) = b$
x = a is a zero of the numerator AND the denominator	x = a is a zero of the numerator but NOT the denominator
The degree of the numerator is exactly one more than the degree of the denominator	x = a is a zero of the denominator but NOT the numerator



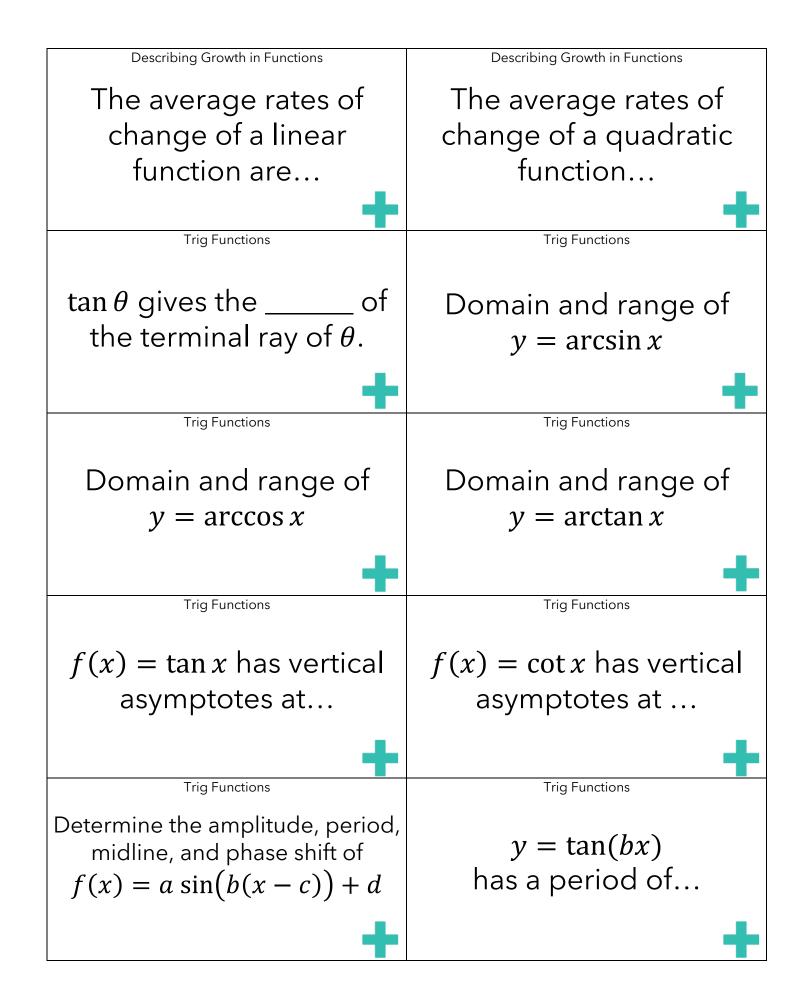
L	±∞ ; ±∞
0 < b < 1	b > 1
 Domain: all real numbers Range: y > 0 Horizontal asymptote at y = 0 Increasing and concave up over entire domain 	 Domain: x > 0 Range: all real numbers Vertical asymptote at x = 0 Increasing and concave down over entire domain
$\frac{b^x}{b^c}$	$b^x \cdot b^c$
0	b ^a



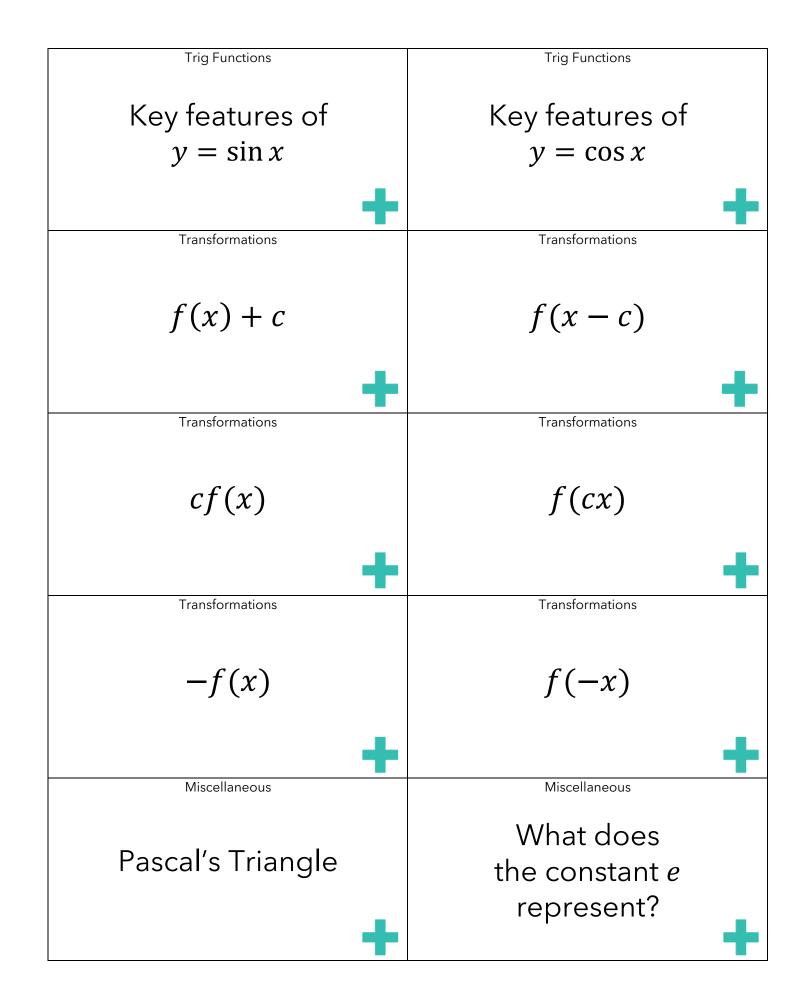
$\log_b m + \log_b n$	1
$k \log_b m$	$\log_b m - \log_b n$
$\frac{\frac{1}{\cos \theta}}{\frac{1}{\sin \theta}}$ $\frac{\frac{1}{\sin \theta}}{\frac{1}{\tan \theta}} = \frac{\cos \theta}{\sin \theta}$	$sin^{2} \theta + cos^{2} \theta = 1$ $1 + cot^{2} \theta = csc^{2} \theta$ $tan^{2} \theta + 1 = sec^{2} \theta$
$\sin \alpha \cos \theta \pm \sin \theta \cos \alpha$	$\cos \alpha \cos \theta \mp \sin \alpha \sin \theta$
2 sin θ cos θ	$cos2 \theta - sin2 \theta$ $= 2 cos2 \theta - 1$ $= 1 - 2 sin2 \theta$



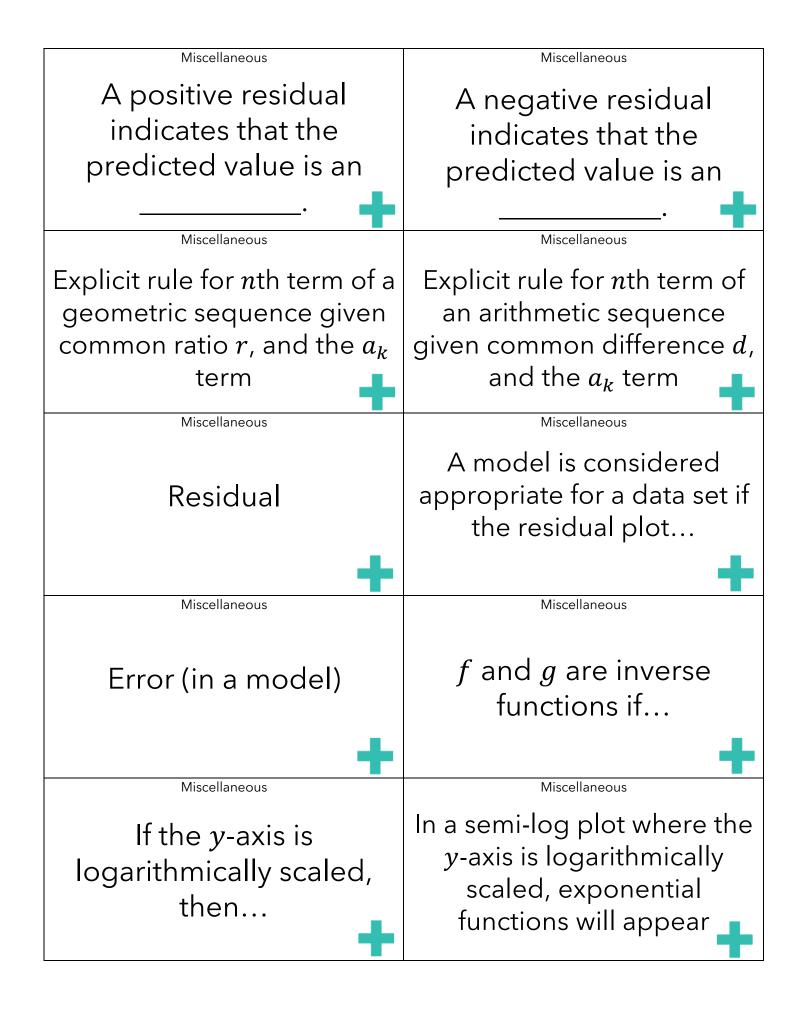
$\begin{aligned} x &= r\cos\theta\\ y &= r\sin\theta \end{aligned}$	$r = \sqrt{x^2 + y^2}$ $\theta = \tan^{-1}\left(\frac{y}{x}\right)$ (*Add π if angle is in Q2 or Q3)
As θ increases,	As $ heta$ increases,
r decreases.	r increases.
<i>r</i> is positive and	<i>r</i> is positive and
decreasing or <i>r</i> is	increasing or <i>r</i> is
negative and increasing.	negative and decreasing.
(<i>r</i> is decreasing)	(<i>r</i> is increasing)
Change by a constant second difference.	Change by a constant amount.
multiplicatively;	additively;
additively	multiplicatively



Are changing at a constant rate OR follow a linear pattern	Constant
Domain: $[-1,1]$ Range: $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$	Slope
Domain: $(-\infty, \infty)$ Range: $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$	Domain: [—1,1] Range: [0, <i>π</i>]
$x = \pi k$, where k is an integer	$x = \frac{\pi}{2} + \pi k$, where k is an integer
$\frac{\pi}{b}$	Amplitude = $ a $ Period = $\frac{2\pi}{b}$ Midline: $y = d$ Phase shift: <i>c</i> units to the right



 Domain: all real numbers Range: [-1, 1] Period: 2π Amplitude: 1 Midline: y = 0 Passes through (0, 1) 	 Domain: all real numbers Range: [-1, 1] Period: 2π Amplitude: 1 Midline: y = 0 Passes through (0, 0)
Horizontal translation <i>c</i> units to the right if <i>c</i> > 0 or <i>c</i> units to the left if <i>c</i> < 0	Vertical translation c units up if c > 0 or c units down if c < 0
Horizontal dilation by a factor of $\frac{1}{c}$	Vertical dilation by a factor of <i>c</i>
Reflection over the y-axis	Reflection over the <i>x</i> -axis
The base rate of growth for all continually growing processes $e \approx 2.718$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$



Overestimate	Underestimate
$a_n = a_k + d(n - k)$	$a_n = a_k \cdot r^{n-k}$
Appears without pattern	Actual value - Predicted value
f(g(x)) = g(f(x)) = x	Predicted value - Actual value
linear	Equal-sized increments on the <i>y</i> -axis represent proportional changes in the output variable