

Functions & Transformations	
FUNCTION NOTATION	$y = f(x)$ Each x in the domain gives exactly one y .
TRANSFORMED FUNCTION	$y = af[k(x - d)] + c$
MAPPING RULE	$(x, y) \rightarrow \left(\frac{x}{k} + d, ay + c\right)$ Stretch or reflect first, then translate.
INVERSE	$f(a) = b \iff f^{-1}(b) = a$ Swap x and y , then solve for y .
PARENT FUNCTIONS	$y = x^2$ $y = \frac{1}{x}$ $y = \sqrt{x}$ $y = x $

Rational Expressions	
MULTIPLYING RADICALS	$\sqrt{a}\sqrt{b} = \sqrt{ab}$ For $a, b \geq 0$.
DIVIDING RADICALS	$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$ For $a \geq 0, b > 0$.
CONJUGATES	$(\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b}) = a - b$
MULTIPLYING	$\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$ Restrictions: $b, d \neq 0$.
DIVIDING	$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$ Restrictions: $b, c, d \neq 0$.
ADDING	$\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$ Use the lowest common denominator when there is one.

Quadratic Functions	
STANDARD FORM	$y = ax^2 + bx + c$
VERTEX FORM	$y = a(x - h)^2 + k$ Vertex (h, k) , axis of symmetry $x = h$.
FACTORED FORM	$y = a(x - r)(x - s)$ Zeros r and s , axis of symmetry $x = \frac{r+s}{2}$.
VERTEX FROM STANDARD FORM	$x = -\frac{b}{2a}$
QUADRATIC FORMULA	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
DISCRIMINANT	$D = b^2 - 4ac$ $D > 0$: two real roots. $D = 0$: one. $D < 0$: none.

Exponential Functions	
PRODUCT AND QUOTIENT LAWS	$a^m \cdot a^n = a^{m+n}$ $\frac{a^m}{a^n} = a^{m-n}$
POWER LAWS	$(a^m)^n = a^{mn}$ $(ab)^n = a^n b^n$
ZERO AND NEGATIVE EXPONENTS	$a^0 = 1$ $a^{-n} = \frac{1}{a^n}$ For $a \neq 0$.
RATIONAL EXPONENTS	$a^{\frac{m}{n}} = (\sqrt[n]{a})^m$
TRANSFORMED EXPONENTIAL	$y = ab^{k(x-d)} + c$
GROWTH AND DECAY	$A = A_0(1 \pm r)^t$ r is the rate per period, t the number of periods.

HALF-LIFE	$A = A_0\left(\frac{1}{2}\right)^{\frac{t}{h}}$ h is the half-life.
DOUBLING	$A = A_0(2)^{\frac{t}{d}}$ d is the doubling time.

Trigonometric Ratios	
PRIMARY RATIOS	$\sin \theta = \frac{\text{opp}}{\text{hyp}}$ $\cos \theta = \frac{\text{adj}}{\text{hyp}}$ $\tan \theta = \frac{\text{opp}}{\text{adj}}$
RECIPROCAL RATIOS	$\csc \theta = \frac{1}{\sin \theta}$ $\sec \theta = \frac{1}{\cos \theta}$ $\cot \theta = \frac{1}{\tan \theta}$
ANGLE IN STANDARD POSITION	$\sin \theta = \frac{y}{r}$ $\cos \theta = \frac{x}{r}$ $\tan \theta = \frac{y}{x}$ For a point (x, y) on the terminal arm, $r = \sqrt{x^2 + y^2}$.
SPECIAL ANGLES	$\sin 30^\circ = \frac{1}{2}$ $\sin 45^\circ = \frac{\sqrt{2}}{2}$ $\sin 60^\circ = \frac{\sqrt{3}}{2}$ And $\cos \theta = \sin(90^\circ - \theta)$.
SINE LAW	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
COSINE LAW	$a^2 = b^2 + c^2 - 2bc \cos A$
AMBIGUOUS CASE	$\sin \theta = \sin(180^\circ - \theta)$ Given two sides and an angle opposite one of them, check both angles.
QUOTIENT IDENTITY	$\tan \theta = \frac{\sin \theta}{\cos \theta}$
PYTHAGOREAN IDENTITY	$\sin^2 \theta + \cos^2 \theta = 1$

Trigonometric Functions	
SINUSOIDAL FUNCTION	$y = a \sin [k(x - d)] + c$ $y = a \cos [k(x - d)] + c$
PERIOD	$\text{period} = \frac{360^\circ}{ k }$
AMPLITUDE	$ a = \frac{\text{max} - \text{min}}{2}$
AXIS OF THE CURVE	$y = c = \frac{\text{max} + \text{min}}{2}$
MAPPING RULE	$(x, y) \rightarrow \left(\frac{x}{k} + d, ay + c\right)$

Discrete Functions	
ARITHMETIC SEQUENCE	$t_n = a + (n - 1)d$
GEOMETRIC SEQUENCE	$t_n = ar^{n-1}$
ARITHMETIC SERIES	$S_n = \frac{n}{2}[2a + (n - 1)d] = \frac{n}{2}(t_1 + t_n)$
GEOMETRIC SERIES	$S_n = \frac{a(r^n - 1)}{r - 1}$ For $r \neq 1$.
PASCAL'S TRIANGLE	$t_{n,r} = t_{n-1,r-1} + t_{n-1,r}$ Row n gives the coefficients of $(a + b)^n$.
SIMPLE INTEREST	$I = Prt$ $A = P + I$
COMPOUND INTEREST	$A = P(1 + i)^n$ i is the rate per compounding period, n the number of periods.
PRESENT VALUE	$PV = A(1 + i)^{-n}$
FUTURE VALUE OF AN ANNUITY	$FV = \frac{R[(1 + i)^n - 1]}{i}$
PRESENT VALUE OF AN ANNUITY	$PV = \frac{R[1 - (1 + i)^{-n}]}{i}$