



## Algebra 2 Formula List

### Rational Exponents

$$a^{\frac{1}{b}} = \sqrt[b]{a}$$

$$a^{\frac{b}{c}} = \sqrt[c]{a^b}$$

### Rules of Logarithms

Remember that these rules work both left-to-right and right-to-left

$$\log_a x + \log_a y = \log_a(xy)$$

$$\log_a x - \log_a y = \log_a\left(\frac{x}{y}\right)$$

$$\log_a x^n = n \log_a x$$

$$\log_a a = 1$$

### The Binomial Theorem

$$(a + b)^n = \sum_{k=0}^n a^k b^{n-k}$$

$$(1 + x)^n = 1 + nx + \frac{n(n-1)x^2}{2!} + \frac{n(n-1)(n-2)x^3}{3!} + \dots$$

### Sequences & Series

The sum of the first  $n$  terms of the arithmetic series  $a_1 + a_2 + \dots + a_{n-1} + a_n$  is given by

$$s_n = \frac{n}{2}(2a_1 + (n-1)d) \text{ or } s_n = \frac{n}{2}(a_1 + a_n)$$

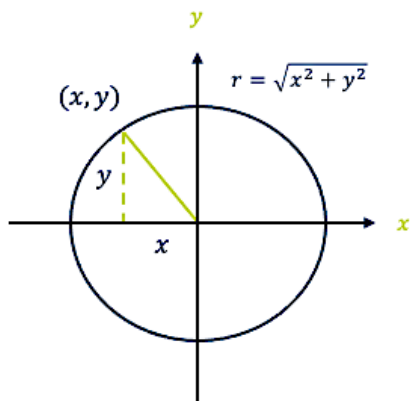
The sum of the first  $n$  terms of the geometric sequence  $a + ar + ar^2 + \dots + ar^{n-1}$  is

$$\text{given by } s_n = \frac{a(1-r^n)}{1-r}$$



## Trigonometry

Circular function definitions, where  $\theta$  is any angle.



$$\sin \theta = \frac{y}{r}$$

$$\tan \theta = \frac{y}{x}$$

$$\sec \theta = \frac{r}{x}$$

$$\cos \theta = \frac{x}{r}$$

$$\csc \theta = \frac{r}{y}$$

$$\cot \theta = \frac{x}{y}$$

### Degree to Radian Conversions

<i>Degrees</i>	30°	45°	60°	90°	120°	150°	180°
<i>Radians</i>	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	$\frac{5\pi}{6}$	$\pi$

<i>Degrees</i>	180°	210°	240°	270°	300°	330°	360°
<i>Radians</i>	$\pi$	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$	$\frac{5\pi}{3}$	$\frac{11\pi}{6}$	$2\pi$



## Trigonometric Exact Values for Common Angles in Degrees

Angle	0	30°	45°	60°	90°
	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
Sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
Cos	0	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
Tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	No value

### Graph Transformation Rules

#### Vertical Translation

$y = f(x) + a$  moves the graph up by ' $a$ ' units  $(x, y) \rightarrow (x, y + a)$

$y = f(x) - a$  moves the graph down by ' $a$ ' units  $(x, y) \rightarrow (x, y - a)$

#### Horizontal Translation

$y = f(x + a)$  moves the graph to the left by ' $a$ ' units  $(x, y) \rightarrow (x - a, y)$

$y = f(x - a)$  moves the graph to the right by ' $a$ ' units  $(x, y) \rightarrow (x + a, y)$

#### Vertical Stretch / Compression

$y = af(x)$   $a > 1$  Graph stretched vertically by a factor of ' $a$ '  $(x, y) \rightarrow (x, ay)$

$y = af(x)$   $a < 1$  Graph compressed vertically by a factor of ' $a$ '  $(x, y) \rightarrow (x, ay)$

#### Horizontal Stretch / Compression

$y = f(ax)$   $a > 1$  Graph compressed horizontally by a factor of ' $a$ '  $(x, y) \rightarrow (\frac{x}{a}, y)$

$y = f(ax)$   $a < 1$  Graph stretched horizontally by a factor of ' $a$ '  $(x, y) \rightarrow (\frac{x}{a}, y)$