



Precalculus Formula List

Functions

The average rate of change of the function f over the interval (a, b) is given by

$$\frac{f(b) - f(a)}{b - a}$$

Rules of Logarithms

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

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

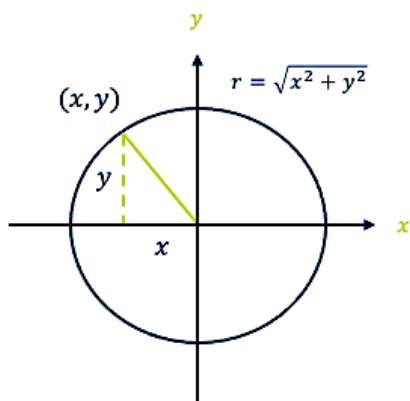
$$\log_a x - \log_a y = \log_a\left(\frac{x}{y}\right)$$

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

$$\log_a a = 1$$

Trigonometry

Circular function definitions, where θ is any angle.



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

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

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

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

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

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



Degree to Radian conversions

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

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

Sum & Difference Formulas (Addition Formulas)

$$\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v$$

$$\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$$

$$\tan(u \pm v) = \frac{\tan u \pm \tan v}{1 \pm \tan u \tan v}$$

Double-Angle Formulas

$$\sin 2x = 2 \sin x \cos x$$

$$\cos 2x = \cos^2 x - \sin^2 x = 2\cos^2 x - 1 = 1 - 2\sin^2 x$$

$$\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$$



Polar Co-ordinates

The polar co-ordinates (r, θ) can be converted to Cartesian using

$$x = r \cos \theta$$

$$y = r \sin \theta$$

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 Nth term of the arithmetic sequence $a_1, a_2, \dots, a_{n-1}, a_n$ is given by $a_1 + (n-1)d$, where d is the common difference.

The sum of the first n terms of the arithmetic series $a_1 + a_2 + \dots + a_{n-1} + a_n$ is given by $s_n = \frac{n}{2}(2a_1 + (n-1)d)$ or $s_n = \frac{n}{2}(a_1 + a_n)$

The Nth term of the geometric sequence $a, ar, ar^2, \dots, ar^{n-1}$ is given by ar^{n-1} , where r is the common ratio.

The sum of the first n terms of the geometric sequence $a + ar + ar^2 + \dots + ar^{n-1}$ is given by $s_n = \frac{a(1-r^n)}{1-r}$