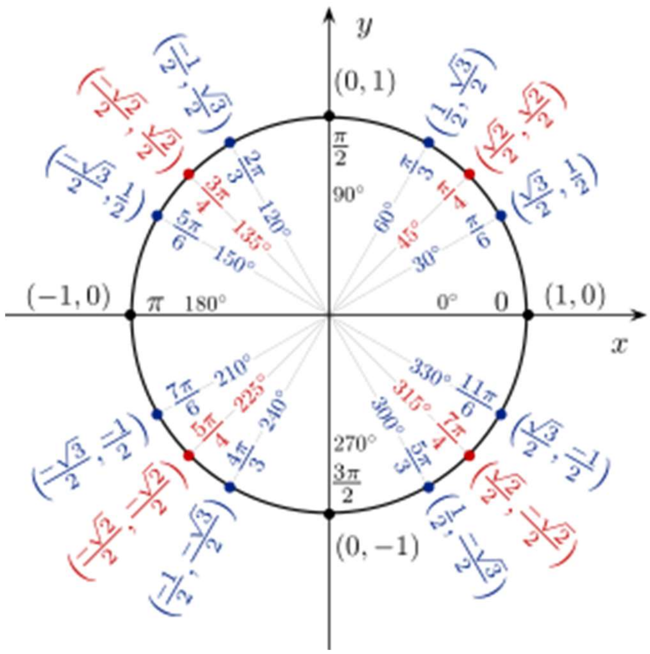


How to calculate the angle of the point (x,y) ? We could use atan2(x,y) if we want a straight-up formula:

This is from https://en.wikipedia.org/wiki/Atan2

Definition and computation [edit]

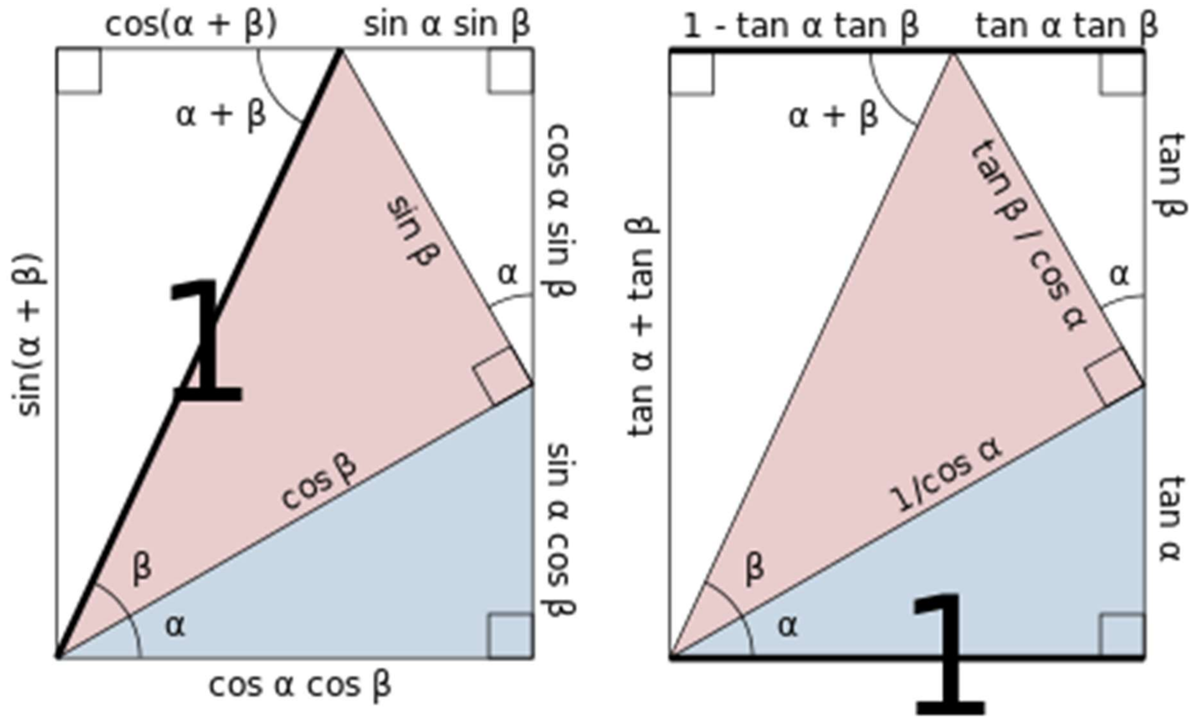
The function atan2 computes the principal value of the argument function applied to the complex number $x + yi$. That is, $\operatorname{atan2}(y, x) = \operatorname{Pr}\arg(x + yi) = \operatorname{Arg}(x + yi)$. The argument could be changed by an arbitrary multiple of 2π (corresponding to a complete turn around the origin) without making any difference to the angle, but to define atan2 uniquely one uses the principal value in the range $(-\pi, \pi]$, that is, $-\pi < \operatorname{atan2}(y, x) \leq \pi$.

In terms of the standard arctan function, whose range is $(-\pi/2, \pi/2)$, it can be expressed as follows:

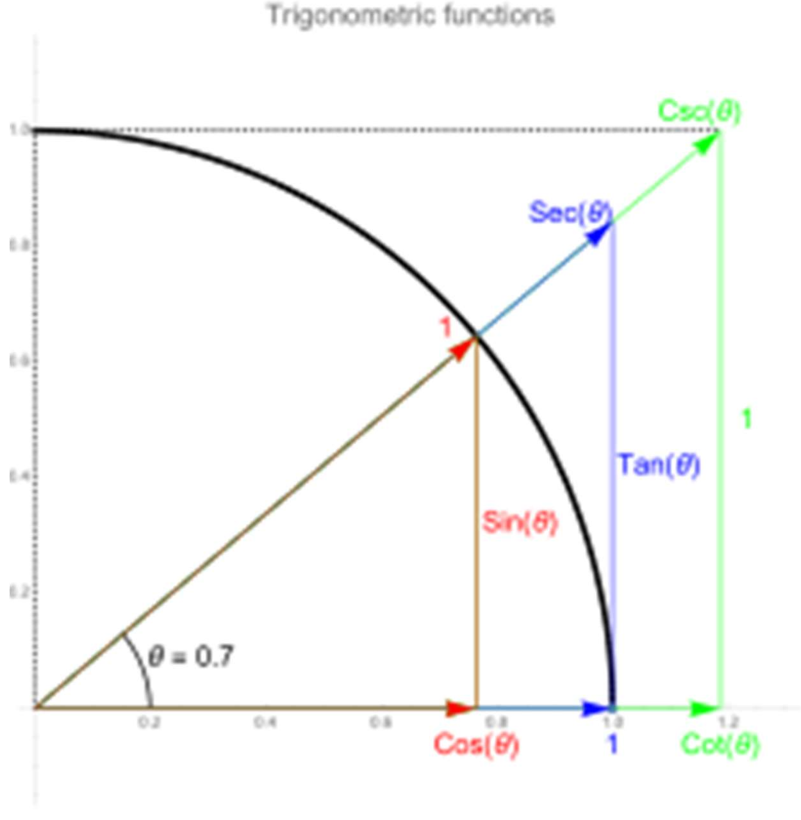
$$\operatorname{atan2}(y, x) = \begin{cases} \arctan(\frac{y}{x}) & \text{if } x > 0, \\ \arctan(\frac{y}{x}) + \pi & \text{if } x < 0 \text{ and } y \geq 0, \\ \arctan(\frac{y}{x}) - \pi & \text{if } x < 0 \text{ and } y < 0, \\ +\frac{\pi}{2} & \text{if } x = 0 \text{ and } y > 0, \\ -\frac{\pi}{2} & \text{if } x = 0 \text{ and } y < 0, \\ \text{undefined} & \text{if } x = 0 \text{ and } y = 0. \end{cases}$$

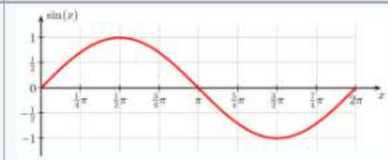
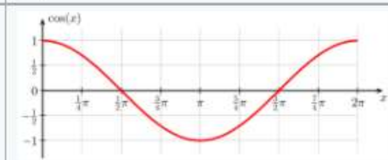
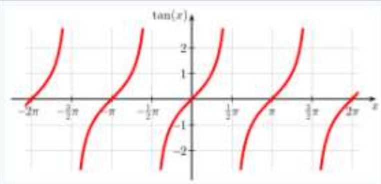
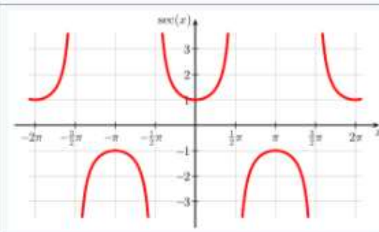
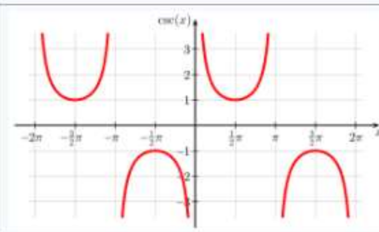
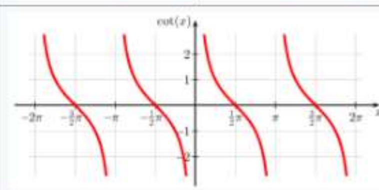
A compact expression with four overlapping half-planes is

$$\operatorname{atan2}(y, x) = \begin{cases} \arctan\left(\frac{y}{x}\right) & \text{if } x > 0, \\ \frac{\pi}{2} - \arctan\left(\frac{x}{y}\right) & \text{if } y > 0, \\ -\frac{\pi}{2} - \arctan\left(\frac{x}{y}\right) & \text{if } y < 0, \\ \arctan\left(\frac{y}{x}\right) \pm \pi & \text{if } x < 0, \\ \text{undefined} & \text{if } x = 0 \text{ and } y = 0. \end{cases}$$



Trigonometric functions



Function	Period	Domain	Range	Graph
sine	2π	$(-\infty, \infty)$	$[-1, 1]$	
cosine	2π	$(-\infty, \infty)$	$[-1, 1]$	
tangent	π	$x \neq \pi/2 + n\pi$	$(-\infty, \infty)$	
secant	2π	$x \neq \pi/2 + n\pi$	$(-\infty, -1] \cup [1, \infty)$	
cosecant	2π	$x \neq n\pi$	$(-\infty, -1] \cup [1, \infty)$	
cotangent	π	$x \neq n\pi$	$(-\infty, \infty)$	

Name	Usual notation	Definition	Domain of *x* for real result	Range of usual principal value (radians)	Range of usual principal value (degrees)
arcsine	$y = \arcsin(x)$	$x = \sin(y)$	$-1 \leq x \leq 1$	$-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$	$-90° \leq y \leq 90°$
arccosine	$y = \arccos(x)$	$x = \cos(y)$	$-1 \leq x \leq 1$	$0 \leq y \leq \pi$	$0° \leq y \leq 180°$
arctangent	$y = \arctan(x)$	$x = \tan(y)$	all real numbers	$-\frac{\pi}{2} < y < \frac{\pi}{2}$	$-90° < y < 90°$
arccotangent	$y = \text{arccot}(x)$	$x = \cot(y)$	all real numbers	$0 < y < \pi$	$0° < y < 180°$
arcsecant	$y = \text{arcsec}(x)$	$x = \sec(y)$	$x \leq -1$ or $1 \leq x$	$0 \leq y < \frac{\pi}{2}$ or $\frac{\pi}{2} < y \leq \pi$	$0° \leq y < 90°$ or $90° < y \leq 180°$
arccosecant	$y = \text{arccsc}(x)$	$x = \csc(y)$	$x \leq -1$ or $1 \leq x$	$-\frac{\pi}{2} \leq y < 0$ or $0 < y \leq \frac{\pi}{2}$	$-90° \leq y < 0°$ or $0° < y \leq 90°$