

## Unit circle

From Wikipedia, the free encyclopedia

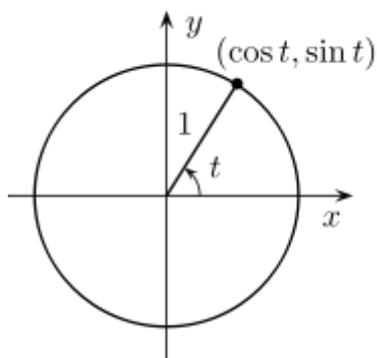


Illustration of a unit circle. The variable  $t$  is an angle measure.

In mathematics, a **unit circle** is a circle with a radius of one. Frequently, especially in trigonometry, the unit circle is the circle of radius one centered at the origin  $(0, 0)$ .

If  $(x, y)$  is a point on the unit circle in the first quadrant, then  $x$  and  $y$  are the lengths of the legs of a right triangle whose hypotenuse has length 1. Thus, by the Pythagorean theorem,  $x$  and  $y$  satisfy the equation

$$x^2 + y^2 = 1.$$

Since  $x^2 = (-x)^2$  for all  $x$ , and since the reflection of any point on the unit circle about the  $x$ - or  $y$ -axis is also on the unit circle, the above equation holds for all points  $(x, y)$  on the unit circle, not just those in the first quadrant.

## Pythagoras

Pythagoras' Theorem says that for a right angled triangle, the square of the long side equals the sum of the squares of the other two sides:

$$x^2 + y^2 = 1^2$$

But  $1^2$  is just 1, so:

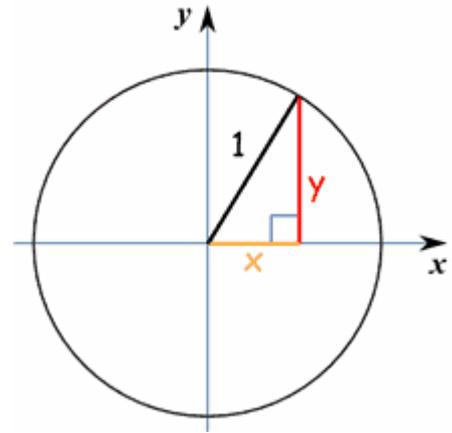
$$x^2 + y^2 = 1$$

(the equation of the unit circle)

Also, since  $x = \cos$  and  $y = \sin$ , we get:

$$(\cos(\theta))^2 + (\sin(\theta))^2 = 1$$

(a useful "identity")



### Important Angles: 30°, 45° and 60°

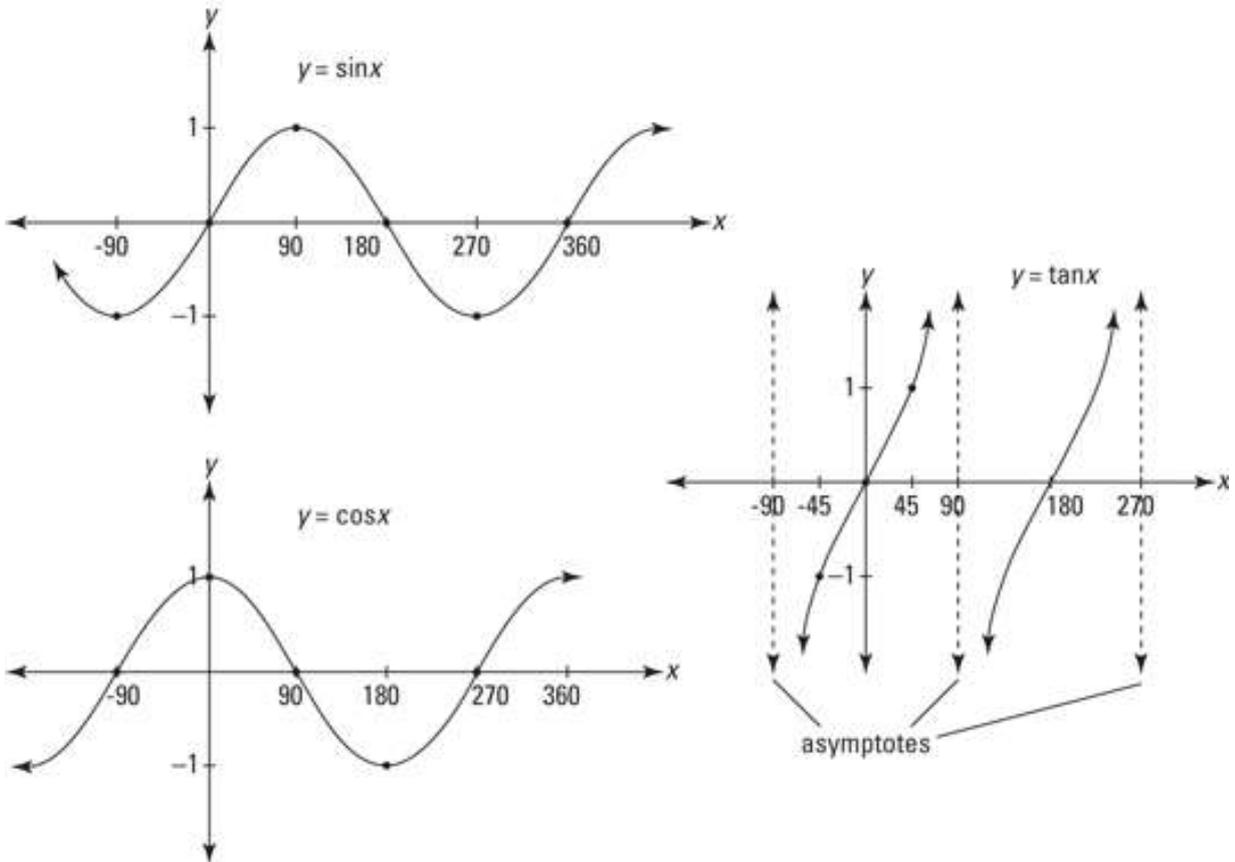
You should try to **remember** sin, cos and tan for the angles 30°, 45° and 60°.

Yes, yes, it is a pain to have to remember things, but it will make life easier when you know them, not just in exams, but other times when you need to do quick estimates, etc.

**These are the values you should remember!**

Angle	Sin	Cos	Tan=Sin/Cos
30°	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$
45°	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1
60°	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$

**Here are the functions in a graph:**



**(X axis is in degree and the Y axis is a number.)**

(From the internet)

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