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TRIGONOMETRIC FUNCTIONS

Sherbekova Sevara Abduxakimovna

Teacher of Mathematics, School of creativity named after Halima Khudoyberdiyev,

Gulistan, Sirdarya region

Annotation: Trigonometric functions play a crucial role in the fields of mathematics, physics, engineering, and several other disciplines. They help describe relationships between angles and sides of triangles, particularly in right-angled triangles, making them fundamental in various applications ranging from architecture to astronomy. Trigonometric functions include sine (sin), cosine (cos), tangent (tan), and their reciprocals: cosecant (csc), secant (sec), and cotangent (cot). Each function has specific definitions based on a right triangle or, alternatively, on the unit circle, which provides a more comprehensive way to understand their behavior.

Key words: Trigonometric functions, formulas, sinx, cosx, tgx, ctgx, graph.

Abstract: Trigonometric functions are the basic six functions that have a domain input value as an angle of a right triangle, and a numeric answer as the range. The trigonometric function (also called the 'trig function') of f(x) = sinθ has a domain, which is the angle θ given in degrees or radians, and a range of [-1, 1]. Similarly we have the domain and range from all other functions.Trigonometric functions are extensively used in calculus, geometry, algebra. Here in the below content, we shall aim at understanding the trigonometric functions across the four quadrants, their graphs, the domain and range, the formulas, and the differentiation, integration of trigonometric functions.

There are six basic trigonometric functions used in Trigonometry. These functions are trigonometric ratios. The six basic trigonometric functions are sine function, cosine function, secant function, cosecant function, tangent function, and co-tangent function. The trigonometric functions and identities are the ratio of sides of a right-angled triangle. The sides of a right triangle are the perpendicular side, hypotenuse, and base, which are used to calculate the sine, cosine, tangent, secant, cosecant, and cotangent values using trigonometric formulas.

Trigonometric Functions Formulas:

We have certain formulas to find the values of the trig functions using the sides of a right-angled triangle. To write these formulas, we use the abbreviated form of these functions. Zine is written as sin, cosine is written as cos, tangent is denoted by tan, secant is denoted by sec, cosecant is abbreviated as cosec, and cotangent is abbreviated as cot. The basic formulas to find the trigonometric functions are as follows:

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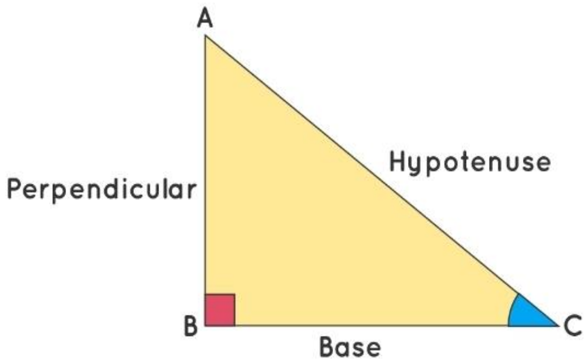

1. sin θ = Perpendicular/Hypotenuse;
2. cos θ = Base/Hypotenuse;
3. tan θ = Perpendicular/Base;
4. sec θ = Hypotenuse/Base;
5. cosec θ = Hypotenuse/Perpendicular;
6. cot θ = Base/Perpendicular.

As we can observe from the above-given formulas, sine and cosecant are reciprocals of each other. Similarly, the reciprocal pairs are cosine and secant, and tangent and cotangent.

Trigonometric Functions Values: The trigonometric functions have a domain θ, which is in degrees or radians.Some of the principal values of θ for the different trigonometric functions are presented below in a table.These principal values are also referred to as standard values of trig functions at specific angles and are frequently used in calculations. The principal values of trigonometric functions have been derived from a unit circle. These values also satisfy all the trigonometric formulas.

θ	0°	30°	45°	60°	90°	180°	270°	360°
sin θ	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1	0	-1	0
cos θ	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0	-1	0	1
tan θ	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not Defined	0	Not Defined	0
cosec θ	Not Defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1	Not Defined	-1	Not Defined
sec θ	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not Defined	-1	Not Defined	1
cot θ	Not Defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0	Not Defined	0	Not Defined

The sine and cosine of an arbitrary angle are defined as:

1. Definition 1: the sine of an angle α is to turn a point (1; 0) into an angle α around the coordinate head the ordinate of the resulting point is said to be (marked as sina, Figure 1).

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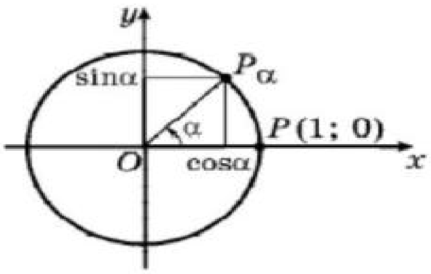
2. Definition 2: α is the cosine of an angle (1; 0) with the point around the coordinate head α is said to be the abscissa of the point formed by turning at an angle (like cosais defined).
3. Definition 3. the tangent of angle α is said to be the ratio of the sine of angle α to its cosine (defined as tga).If every real number x is matched with a Syn number, then the real numbers are the set will be given a function y = sinx. y = cosx, y = tgx and y = ctgx functions similarly defined



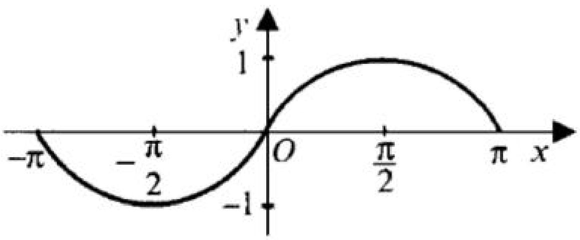
y = sinx is the property and graph of the function.

1. y = sinx the basic property of the function:

1. the function is defined on the set of all real numbers, i.e. x є R;
2. the function is finite, and its set of values consists of a cross section [-1; 1]; x = π / 2 + 2kn, K є Z taking the largest values at points where the function is equal to 1 makes, x = -π/2 + 2kn, and k є Z takes the smallest values equal to -1 at points; the function is odd: for all x є R, sin (- x) = - sin x ;
3. a function is a periodic function with the smallest positive period equal to 2π: all for x € R, sin (x + 2π) = sinx ;
4. in all x є (2kn; π + 2kn), K€Z sinx > 0;
5. in all x є (π + 2kπ; 2π + 2kπ), K€ Z sinx < 0;
6. in all points x = nk, x є R sinx = 0. Hence its X of the argument

0, ±π; ±2π; ... the values are called the zeros of the function y = sinx the function [- π/2 + 2kn; π/2 + 2kn+, K є Z grows from -1 to 1 at intervals, [- π/2]2kn; π/2 + 2kn+, while K€Z decreases from 1 to -1 at intervals.

2. Using the properties of the sine, first the length of its graph is the length of the function we make in the range [–π; π], which is equal to the period.



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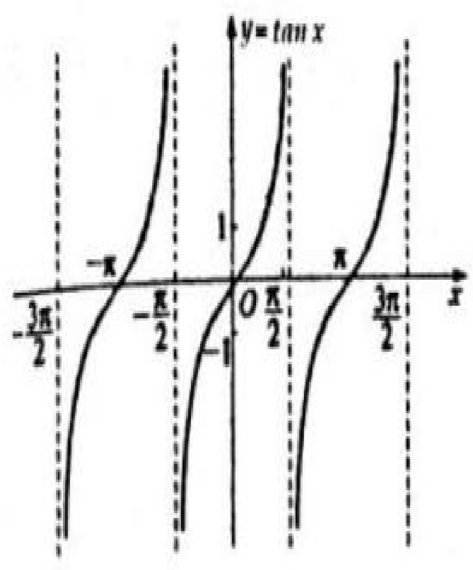
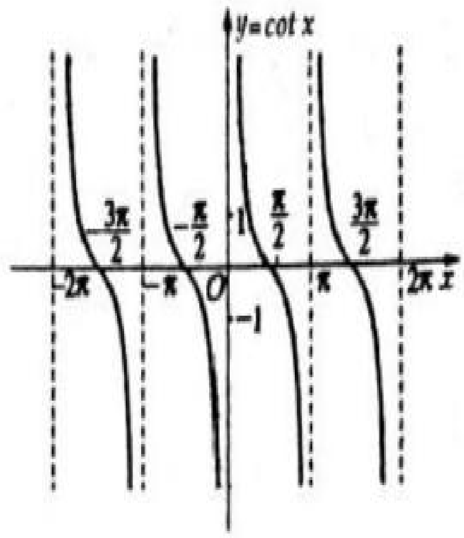
The following graphs give graphs of y = tg x and y = ctg x:





Conclusion: Trigonometric functions from a methodological point of view are the most difficult for both the teacher and the student in terms of understanding and mastering considered one of the topics.In trigonometry, the angle is found in degrees, radian values, or numerical values. These concepts are interrelated, and through one the other arises. The first to note that the total measurement of the circle is 360 degrees, Sumerian proved by his astronomers, among which the Babylonians are similar they study the ratio of the sides of the triangles. Similar studies it follows that the determination of a triangle from the surface depends on trigonometry. The origin of trigonometry is inextricably linked with the science of astronomy, since it is the same science is used to solve the problems of ancient scientists different in the Triangle began to study the ratio of quantities.

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