What are even functions? What are odd functions?

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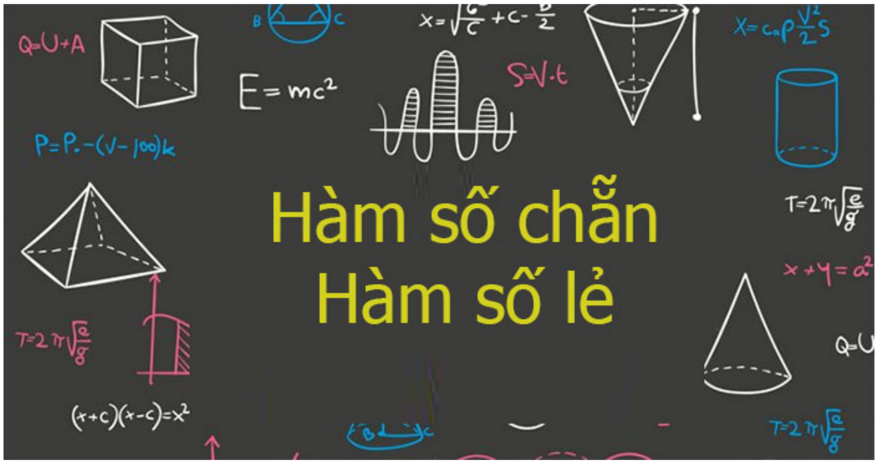
Functions in mathematics can be classified as even and odd functions based on their symmetry along an axis. An even function is one that remains constant when its input is negated (the output is the same for x and -x), reflecting symmetry around the y-axis. An odd function, on the other hand, becomes a negative function when its input is negated, exhibiting symmetry around the origin. A function f is even if f(-x) = f(x) for all x in the domain of f. A function f is odd if **f(-x) = -f(x)** for all x in the domain of f, i.e.:

1. Even function:`f(-x) = f(x)`
2. Odd function:`f(-x) = -f(x)`

In this article, we will discuss in detail even and odd functions, the definition of even and odd functions, even and odd functions in trigonometry, graphs of even and odd functions, and many other topics and essential information.



What is an even function?

A function y = f(x) with domain D is called an even function if it satisfies the following two conditions:

1. ? x ? D ? ? x ? D
2. ? x ? D : f (? x) = f (x)

Example: The function $y = x^2$ is an even function.

What are odd functions?

A function y = f(x) with domain D is called an odd function if it satisfies the following two conditions:

1. ? x ? D ? ? x ? D
2. ? x ? D : f (?x)= ? f(x)

Example: Example: The function y = x is an odd function

Note: The first condition is called the condition that the domain is symmetric with respect to zero.

For example, D = (-2;2) is a set symmetric with respect to 0, while the set D' = [-2;3] is not symmetric with respect to 0.

The set R = (??;+?) is a symmetric set.

Note: A function does not necessarily have to be an even or odd function.

For example, the function y = 2x + 1 is neither an even nor an odd function because:

At x = 1, we have f(1) = 2.1 + 1 = 3

At x = -1, we have f(-1) = 2.(-1) + 1 = -1

? The two values ??f(1) and f(-1) are neither equal nor opposite.

Graphs of even and odd functions

An even function has a graph that is symmetrical with respect to the y-axis (Oy).

Odd functions have graphs that are symmetrical with respect to the origin O.

What is a function that is neither even nor odd?

Not every function can be determined as either even or odd. Some functions are neither even nor odd, such as: $y=x^2+x$, y=tan(x-1),…

Additionally, there is a special type of function: a function that is both even and odd. For example, the function y=0.

Remember a common even/odd function

Even function

$y = ax2 + bx + c$ if and only if $b = 0$

Fourth-degree quartic function

$y = \cos x$

$y = f(x)$

Odd function

$y = ax + b$ if and only if $b = 0$

$y = ax^3 + bx^2 + cx + d$ if and only if $b = d = 0$

$y = \sin x$; $y = \tan x$; $y = \cot x$

Other cases

If F(x) is an even function and has a derivative on its domain, then its derivative is an odd function.

If F(x) is an odd function and has a derivative on its domain, then its derivative is an even function.

An odd-degree polynomial function is not an even-degree function.

An even-degree polynomial function is not an odd function.

How to determine whether a function is even or odd.

To determine whether a function is even or odd, follow these steps:

Step 1: Find the domain: D

If ?x ? D ? -x ? D, proceed to step three.

If ? x0 ? D ? -x0 ? D, we can conclude that the function is neither even nor odd.

Step 2: Replace x with -x and calculate f(-x)

Step 3: Determine the sign (compare f(x) and f(-x)):

° If $f(-x) = f(x)$, then the function f is even.

° If $f(-x) = -f(x)$, then the function f is odd.

° Another case: the function f has no even or odd properties

Exercises on determining the even or odd nature of a function

Exercise 4, page 39, Algebra 10 textbook: Determine the even or odd nature of the following functions:

a) y = |x|;

b) y = (x + 2)2;

c) y = x^3 + x;

d) y = x2 + x + 1.

Prize

a) Let y = f(x) = |x|.

Domain: D = R, so for all x ? D, –x ? D.

° f(–x) = |–x| = |x| = f(x).

Therefore, the function y = |x| is an even function.

b) Let y = f(x) = (x + 2)2.

Domain: D = R, so for all x ? D, –x ? D.

° f(–x) = (–x + 2)2 = (x – 2)2 ? (x + 2)2 = f(x)

° f(–x) = (–x + 2)2 = (x – 2)2 ? – (x + 2)2 = –f(x).

Therefore, the function y = (x + 2)2 is neither an even nor an odd function.

c) Let y = f(x) = x3 + x.

Domain: D = R, so for all x ? D, –x ? D.

° f(–x) = (–x)3 + (–x) = –x3 – x = – (x3 + x) = –f(x)

Therefore, y = x^3 + x is an odd function.

d) Let y = f(x) = x2 + x + 1.

Domain: D = R, so for all x ? D, –x ? D.

° f(–x) = (–x)2 + (–x) + 1 = x2 – x + 1 ? x2 + x + 1 = f(x)

° f(–x) = (–x)2 + (–x) + 1 = x2 – x + 1 ? –(x2 + x + 1) = –f(x)

Therefore, the function y = x^2 + x + 1 is neither an even nor an odd function.

Is there a function defined on R that is both an even and an odd function?

Prize:

It is easy to see that the function y = 0 is defined on R, and is both an even and an odd function.

Suppose the function y = f(x) is any function with such properties. Then for every x belonging to R we have:

F (–x) = f (x) (because f is an even function);

F (–x) = – f (x) (because f is an odd function).

From this, we can deduce that for every x belonging to R, f(x)=?f(x), meaning f(x)=0. Thus, y=0 is the only function defined on R that is both an even and an odd function.

Frequently Asked Questions about Even and Odd Functions

What are even and odd functions?

If f(x) = f(?x) for all x in their domain, then even functions are symmetric around the y-axis. Odd functions are symmetric around the origin, meaning that for all x in their domain, f(?x) = ?f(x).

How can we tell if a function is even or odd?

A function is even if f(-x) = f(x), and odd if f(-x) = -f(x) for every element in the domain of f. If it does not satisfy any of these properties, then it is neither odd nor even.

What is the difference between odd and even periodic functions?

The difference between odd and even periodic functions: An even function satisfies f(?x) = f(x) for all x in the domain, while an odd function satisfies f(?x) = ?f(x).

Besides even and odd functions, you can also learn about other important mathematical concepts such as perfect squares , irrational numbers, rational numbers , prime numbers , natural numbers , etc., in the Education section of TipsMake.com.

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