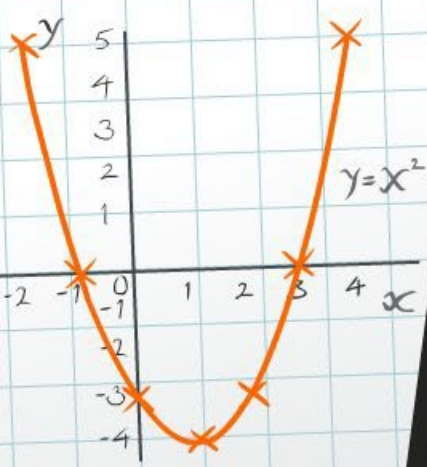
Even and odd functions

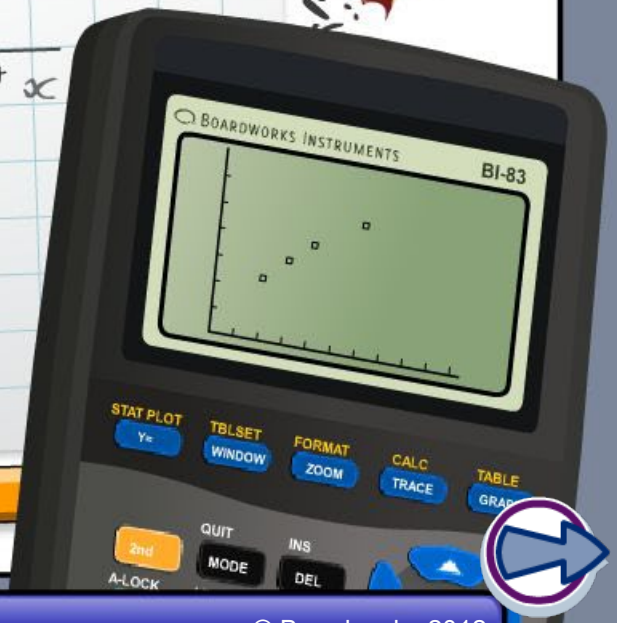
x	-2	-1	0	1	2	3	4
y	5	0	-3	-4	-3	0	5

$x^2 - 2x - 3 = 0$

$(x+1)(x-3) = 0$

$x = -1$ or $x = 3$





Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

They are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

Even functions

If a function is such that $f(-x) = f(x)$ for all values of x, it is called an **even function**.

For example, show that $f(x) = 3x^4 - x^2 + 2$ is an even function.

$f(-x) = 3(-x)^4 - (-x)^2 + 2$

$= 3x^4 - x^2 + 2$

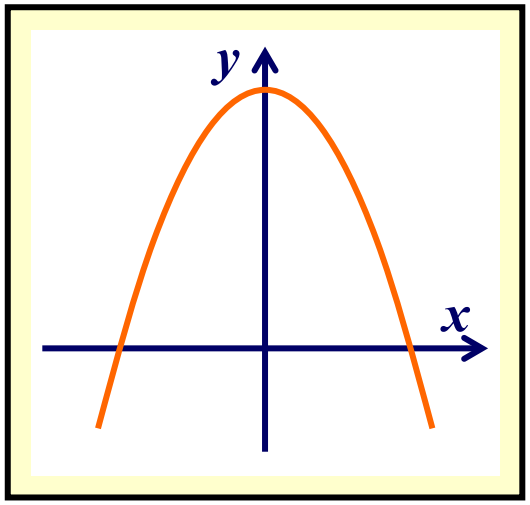
$= f(x)$

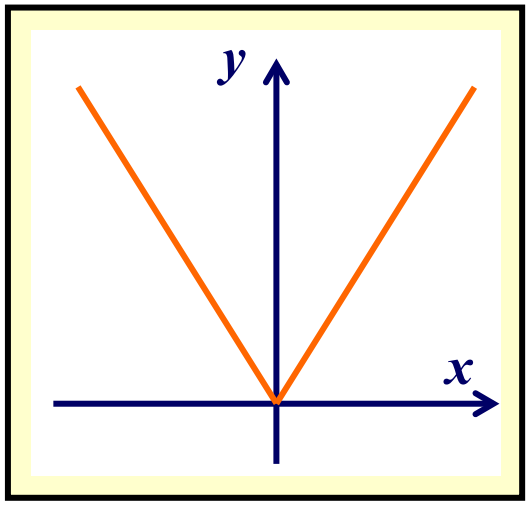
$f(-x) = f(x)$, so the function is even.

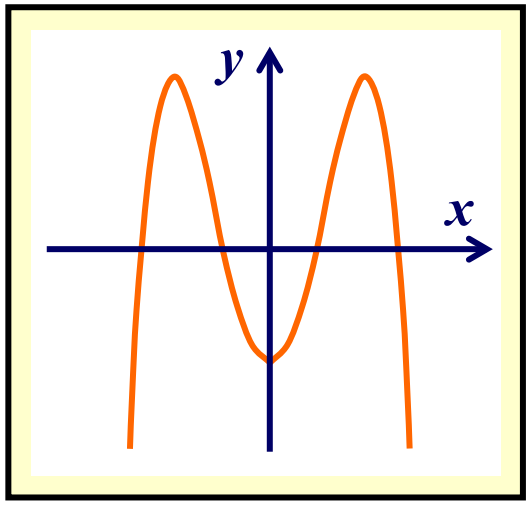
Can you write down another even function?

Graphs of even functions

Here are the graphs of some even functions:







What do you notice about these graphs?

The graphs of all even functions are symmetric about the y-axis.

Odd functions

If a function is such that $f(-x) = -f(x)$ for all values of x, it is called an **odd function**.

For example, show that $f(x) = x^3 + 4x$ is an odd function.

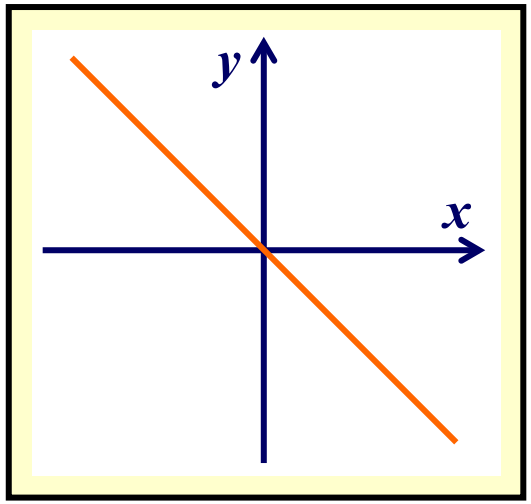
$$f(-x) = (-x)^3 + 4(-x)$$
$$= -x^3 - 4x$$
$$= -(x^3 + 4x)$$
$$= -f(x)$$

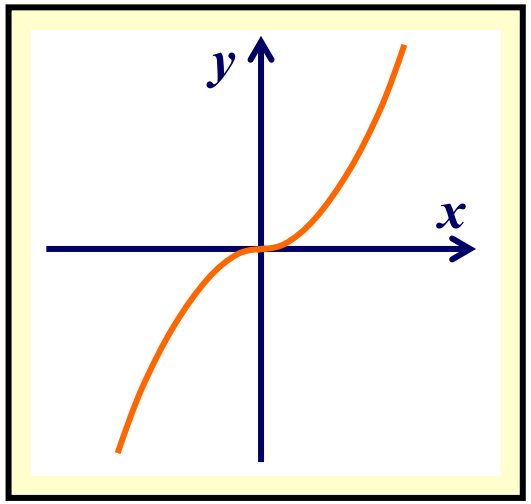
$f(-x) = -f(x)$, so the function is odd.

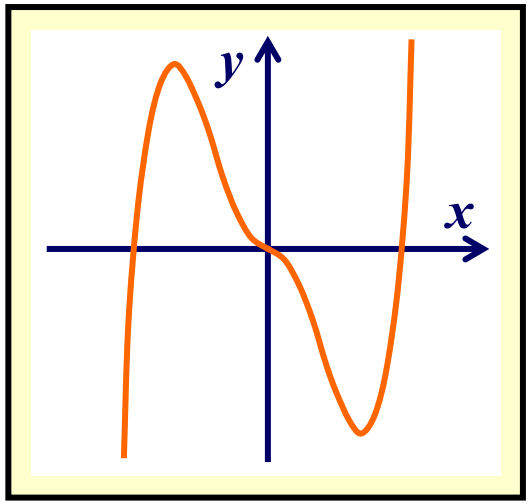
Can you write down another odd function?

Graphs of odd functions

Here are the graphs of some odd functions:







What do you notice about these graphs?

The graphs of all odd functions have order 2 rotational symmetry about the origin.

Even or odd?

Is the function even or odd?

Question: 1/10

$f(x) = x^3 + x$

Even

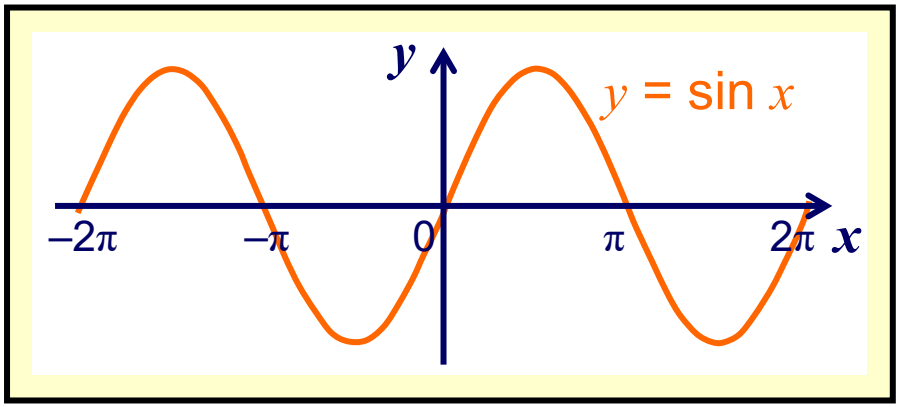
Odd

Periodic functions

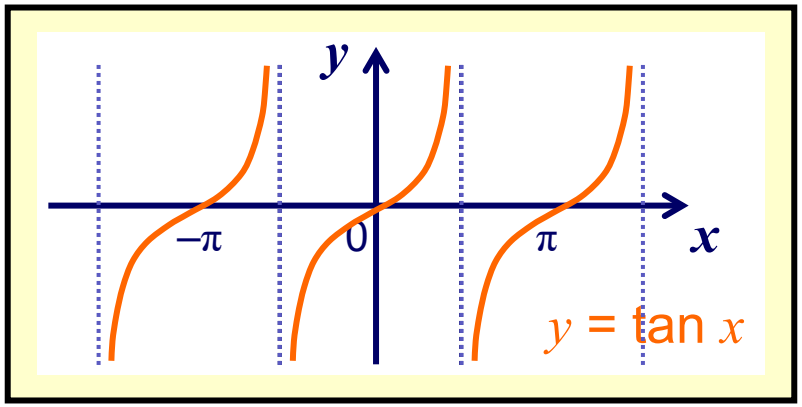
A function with a pattern that repeats at regular intervals is called a **periodic function**.

The interval over which a periodic function repeats is called the **period** of the function.

For example:



This graph has a period of 2π.



This graph has a period of π.