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Functions and Their Graphs

Key Definitions

Function - a relationship between values: each of its input values(x) gives back exactly one output value(y)

Domain - set of all input values(x)

Range - set of all output values(y)

Tell whether the equations represent y as a function of x.

a. $x^2 + y = 1$

Solve for y.

$y = 1 - x^2$

For every number we plug in for x, do we get more than one y out?

No, so this equation is a function.

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

Solve for y.

$y^2 = x + 1$

$$y = \pm\sqrt{1 + x}$$

Here we have 2 y's for each x that we plug in. Therefore, this equation is not a function.

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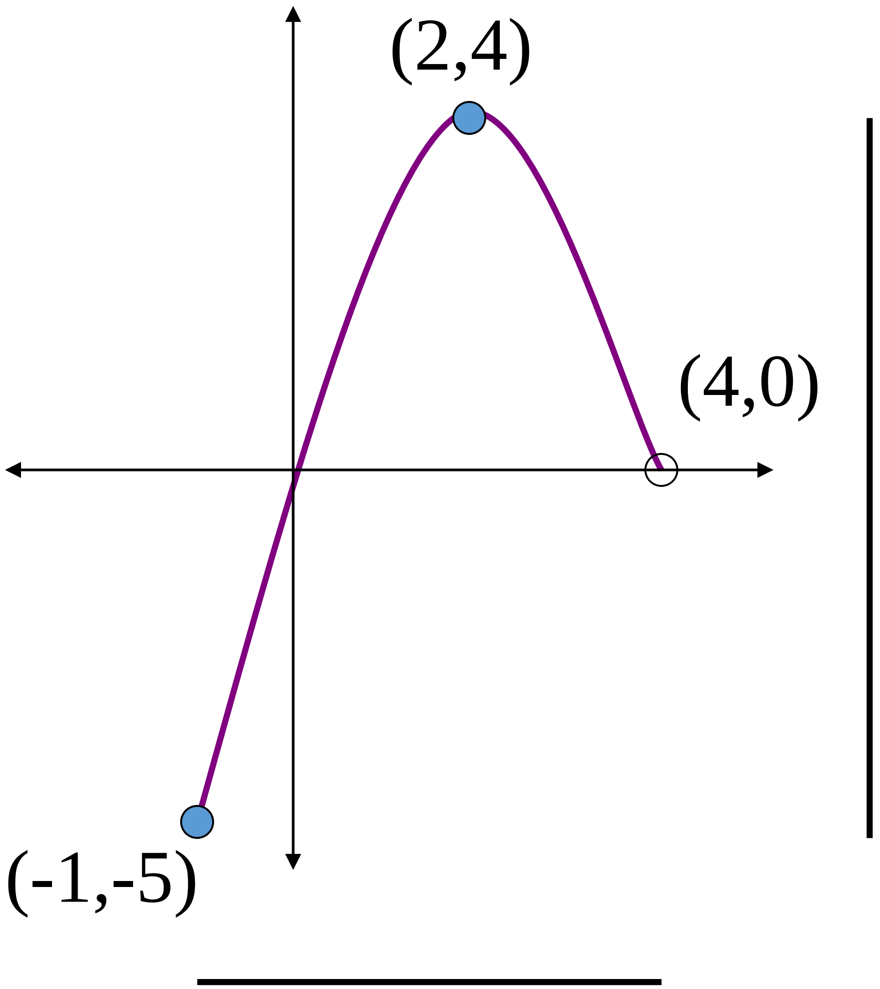
Find:

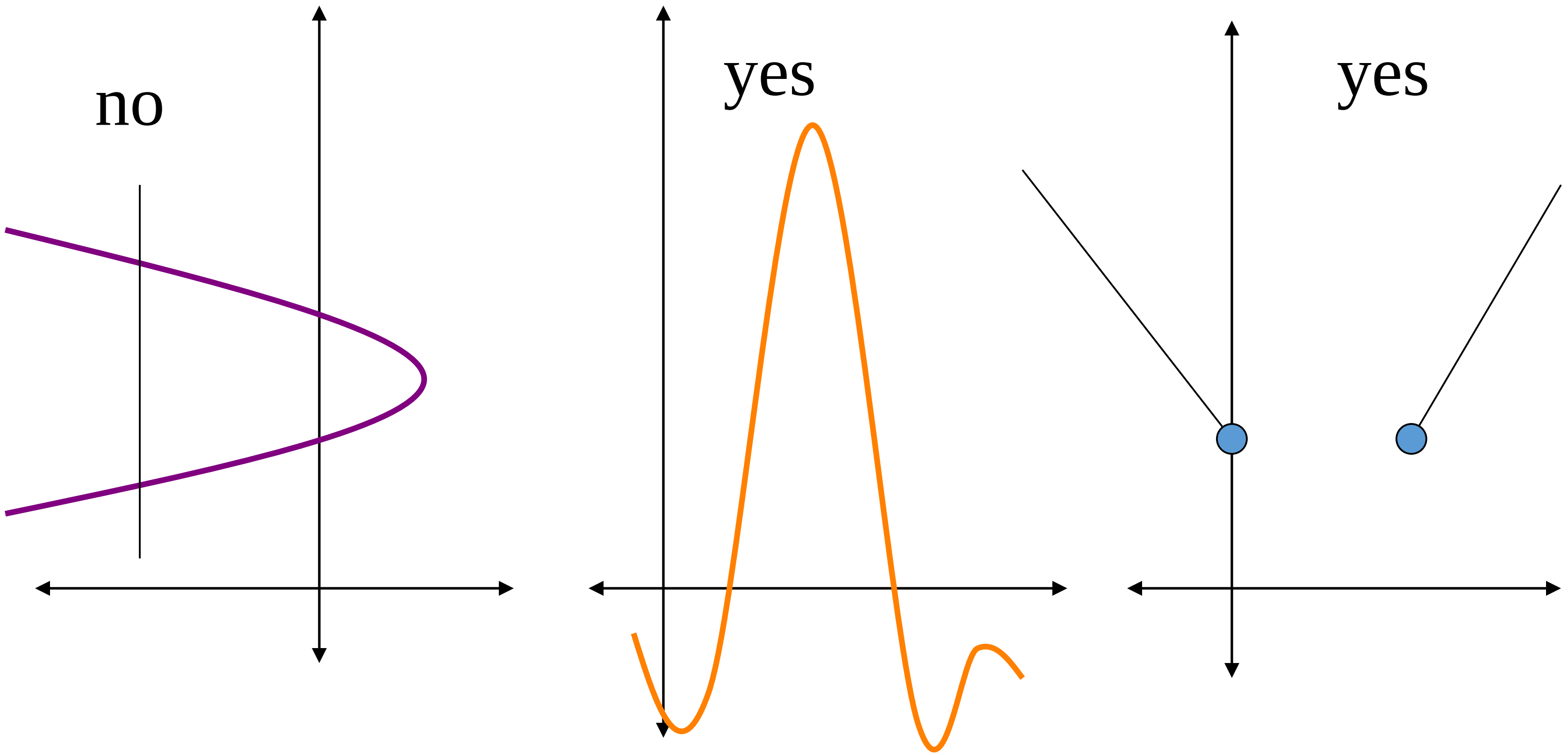
a. the domain
   [-1,4)
b. the range
   [-5,4]
c. f(-1) = -5

d. f(2) = 4



Vertical Line Test for Functions

Do the graphs represent y as a function of x?



Tests for Even and Odd Functions

A function is $y = f(x)$ is <u>even</u> if, for each x in the domain of f,

$$f(-x) = f(x)$$

An even function is symmetric about the y-axis.

A function is $y = f(x)$ is <u>odd</u> if, for each x in the domain of f,

$$f(-x) = -f(x)$$

An odd function is symmetric about the origin.

Ex. $g(x) = x^3 - x$

$g(-x) = (-x)^3 – (-x) = -x^3 + x = -(x^3 – x)$

Therefore, g(x) is odd because $f(-x) = -f(x)$

Ex. $h(x) = x^2 + 1$

$h(-x) = (-x)^2 + 1 = x^2 + 1$

h(x) is even because $f(-x) = f(x)$

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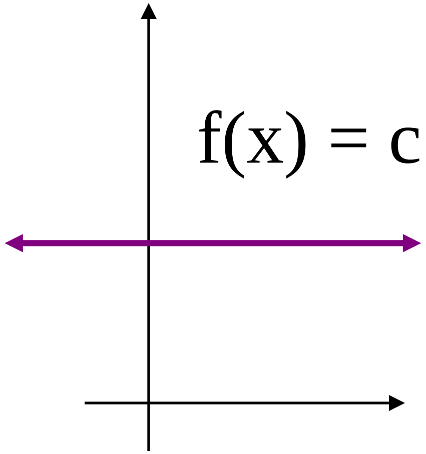
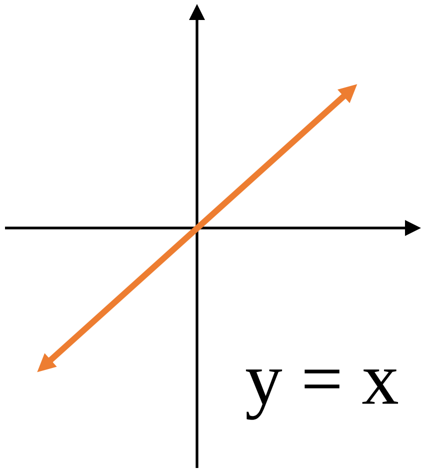
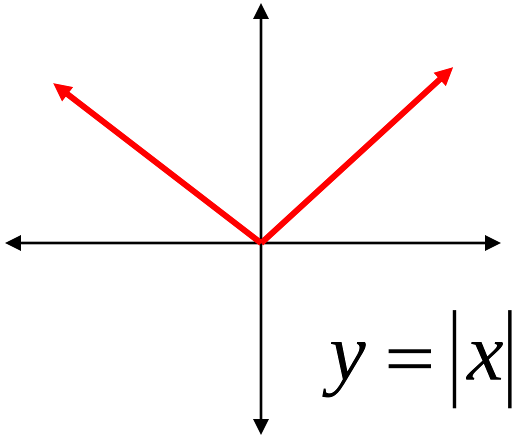
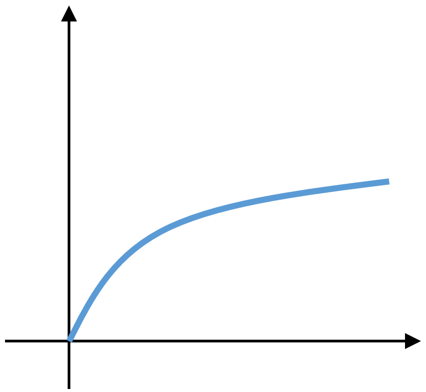
Summary of Graphs of Common Functions

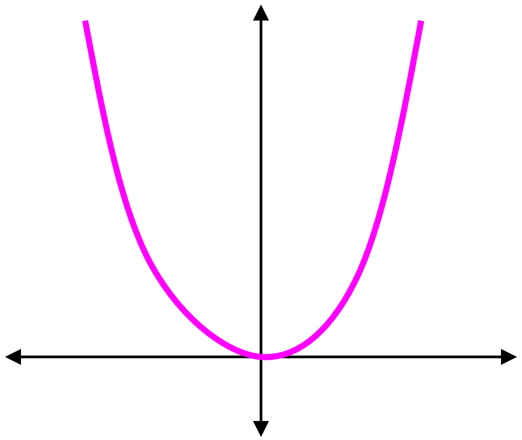




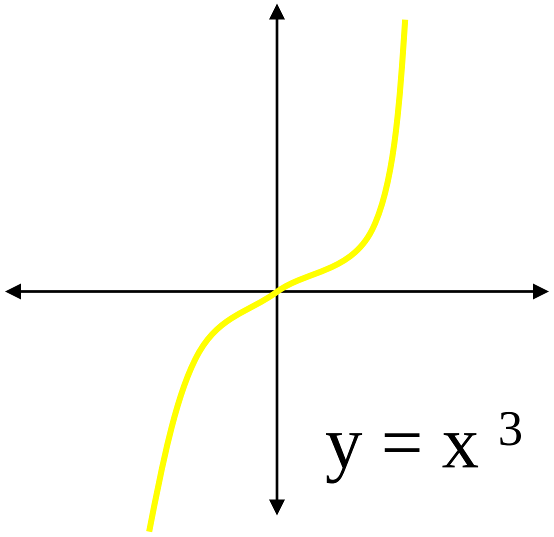




$$y = \sqrt{x}$$



$$y = x^2$$



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Vertical and Horizontal Shifts

1. $h(x) = f(x) + c$ — Vert. shift up
2. $h(x) = f(x) - c$ — Vert. shift down
3. $h(x) = f(x - c)$ — Horiz. shift right
4. $h(x) = f(x + c)$ — Horiz. shift left
5. $h(x) = -f(x)$ — Reflection in the x-axis
6. $h(x) = f(-x)$ — Reflection in the y-axis