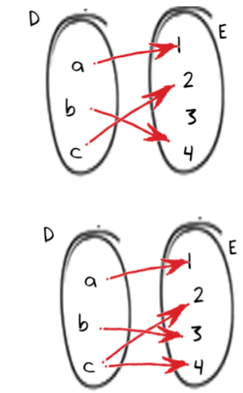
1.1 Four ways to represent a function Verbally-numerically- visually (graph) - algebraically

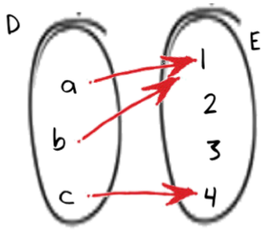
Function:

A Function f is a rule that assigns to each element × € D exactly one element, called f(x) € E

Domain is the value of x

Range is the set of all possible values





Domain = _ _ _ _

Range = _ _ _ _

Codomain = _ _ _ _

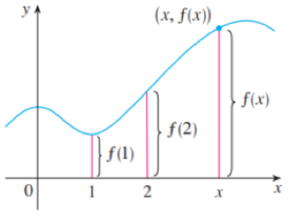


FIGURE 4

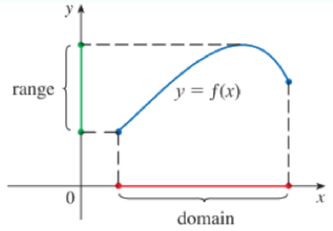
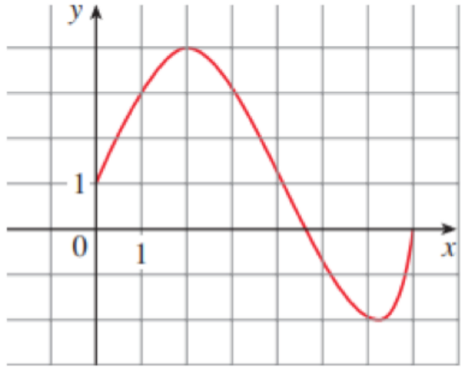


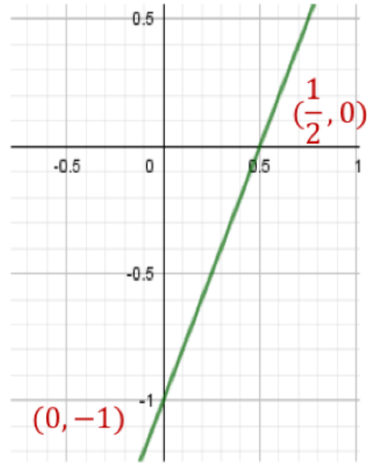
FIGURE 5

The graph of a function f is shown in the following Figure.
(a) Find the values of f(1) and f(3).
(b) What are the domain and range of f?



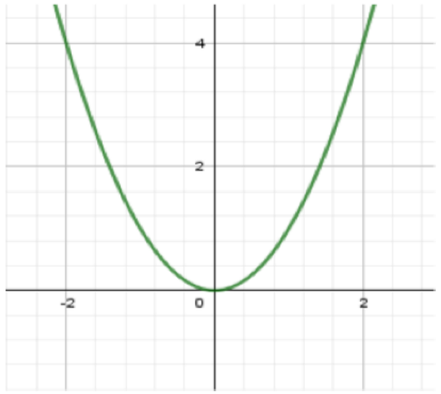
Sketch the graph and find the domain and range of each function.

$(a)\ f(x) = 2x - 1$



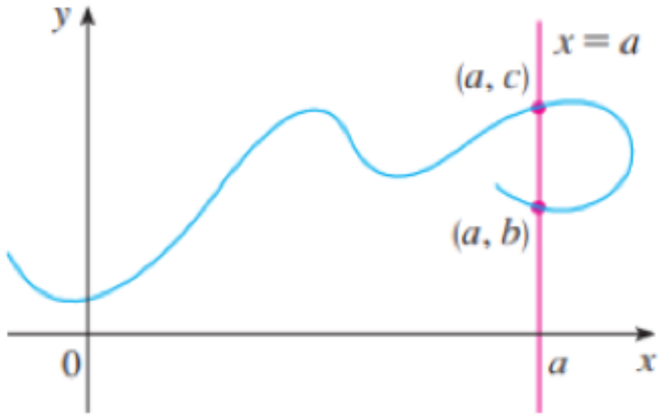
Sketch the graph and find the domain and range of each function.

$(b)\quad g(x) = x^2$

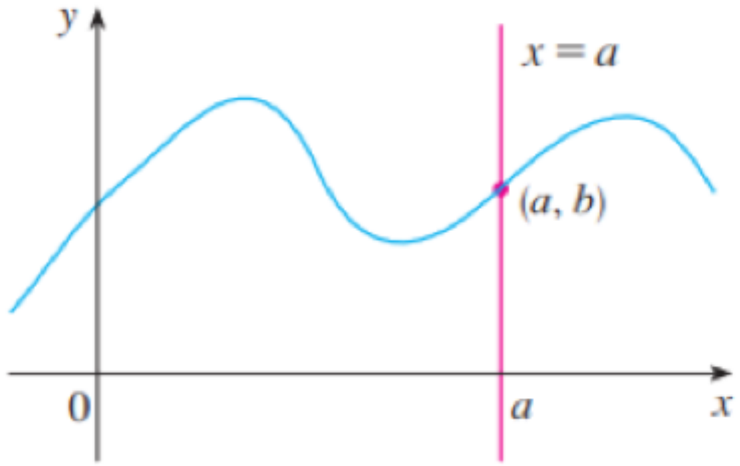


The vertical line Test

A curve in the xy plane is the graph of a function of x if no vertical line intersects the curve more than once.



(b) This curve doesn't represent a function.



(a) This curve represents a function.

Piecewise function

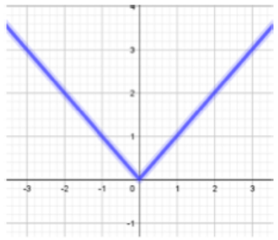
is a function that is defined by different formulas in different parts of their domains.

Sketch the graph of

$$f(x) = |x| = \begin{cases} x & if \ x \geq 0 \\ -x & if \ x < 0 \end{cases}$$

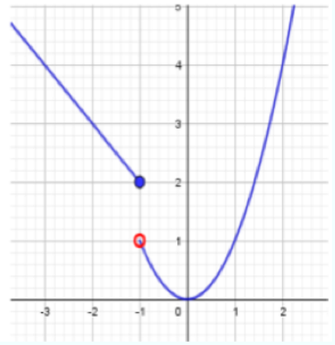
Domain

Range



$$f(x) = \begin{cases} 1 - x, & x \leq -1 \\ x^2, & x > -1 \end{cases}$$

Evaluate f(-2), f(-1) and f (0) and sketch the graph.



Properties of Absolute Values

Suppose a > 0 is any real number .Then

1. $|x| = |-x|$
2. $|x| \leq a \Leftrightarrow -a \leq x \leq a \ . \{x \in [-a, a]\}$
3. $|x| \geq a \Leftrightarrow x \geq a \text{ or } x \leq -a \ . \quad \{x \in (-\infty, -a] \cup [a, \infty)\}$
4. $|x| = a \Leftrightarrow x = \pm a$

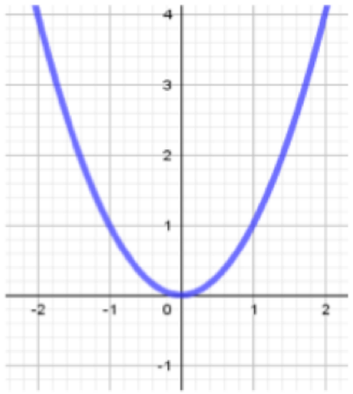
$\sqrt{a^2} = a$ if $a \geq 0$. $\quad \sqrt{(-a)^2} = -a$ if $a < 0$.

$\sqrt{a^2} = |a|$

Even function

if $f(-x) = f(x)\ \forall\ x \in D$, then f is called an even function.

The graph is symmetric with **respect to the _____.**

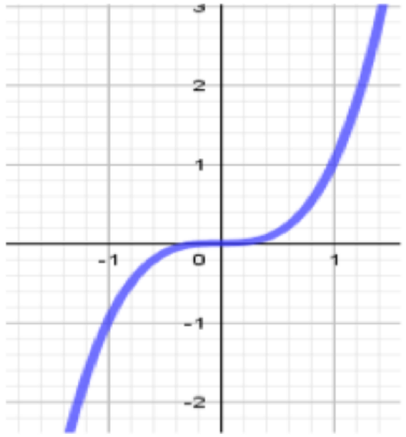


$f(x) = x^2$ is even

Odd function

If $f(-x) = -f(x)\ \forall\ x \in D$, then f is called an odd function.

The graph is **symmetric with respect to the _____.**



$f(x) = x^3$ is odd

even ± even → even

odd ± odd → odd

odd ± even → neither

even × even → even

odd × odd → even

odd × even → odd

(a) $f(x) = c$ is _____

(b) $f(x) = |x|$ is _____

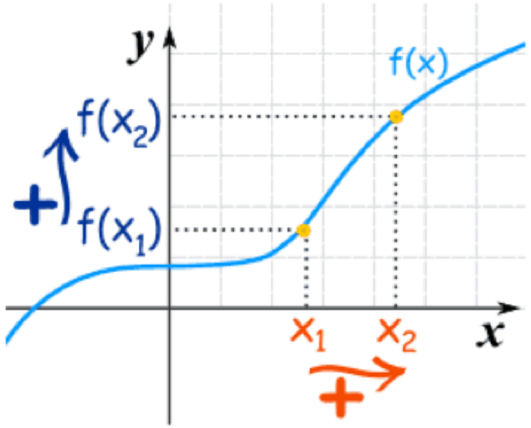
(c) $f(x) = x^n$ is $\begin{cases} --- & \text{if } n \text{ is even} \\ \_\_\_\_\_ & \text{if } n \text{ is odd} \end{cases}$

(a) $f(x) = x^5 + x.$ (b) $f(x) = 1 - x^4$ (c) $f(x) = 2x - x^2$

Increasing and Decreasing

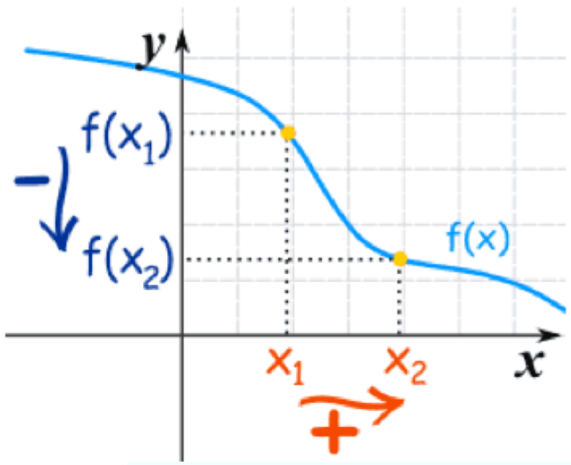
A function f is called **increasing** on an interval I

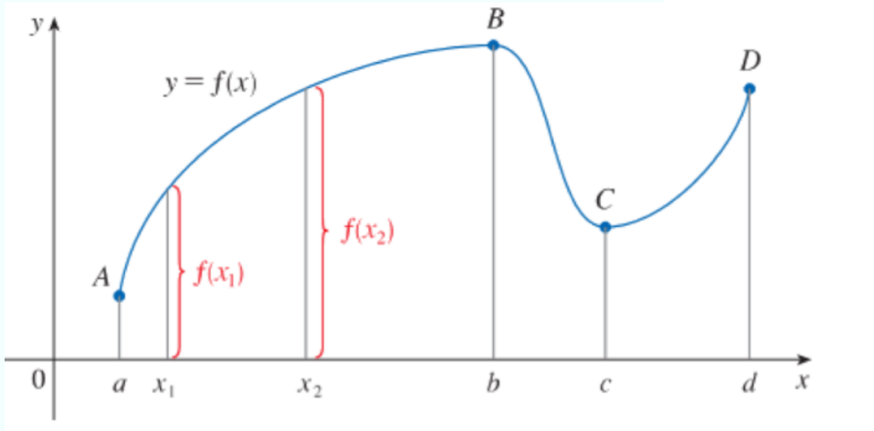
if $f(x_1) < f(x_2)$ whenever $x_1 < x_2$ in I.



A function f is called **decreasing** on an interval I

$if\ f(x_1) > f(x_2)\ ,\ x_1 < x_2$ in I .





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