Salahaddin University-Erbil
College of Engineering
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First Year Students
2nd Semester

Mathematics I
Function and Graphs(Ch.1)

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1.2. Function and the Graphs

- In each case, the value of one variable quantity, which we might call y, depends on the value of another variable quantity, which we might call x. Since the value of y is completely determined by the value of x, we say that y is a function of x.
- A function from a set D (Domain) to a set R (Range) is a rule that assigns a single element of R to each element to D it can be described as in the diagram below

Which means

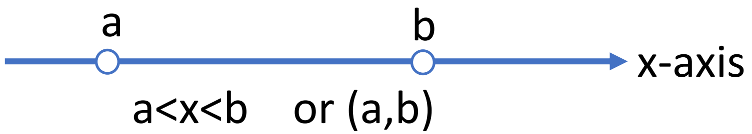
A special relationship where each input has a single output

- Symbolic way to say y is a function of x is $y = f(x)$

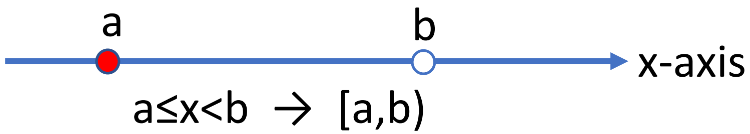
1.2. Function and the Graphs(Cont.)

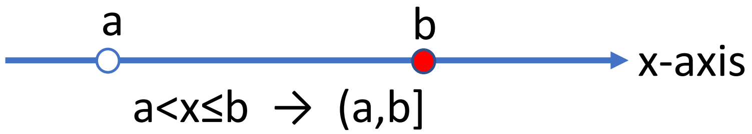
- Intervals: The set of values that the variable may take on.

- Open interval: A set of real numbers that does not include its endpoints.

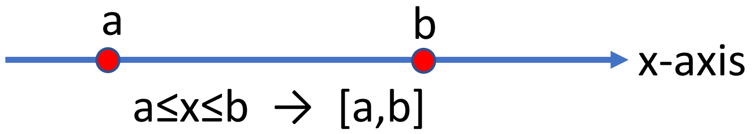


- Half open intervals: A set for which one endpoint is a real number and the other is not.





- Closed interval: A set of real numbers that includes both of its endpoints.



- The end point of the interval called boundary points, the remaining points make up the interval called interior point

1.2. Function and the Graphs(Cont.)

- Domain and Range
- Domain: The largest set of x-values for which the formula gives real y-values.
- Example

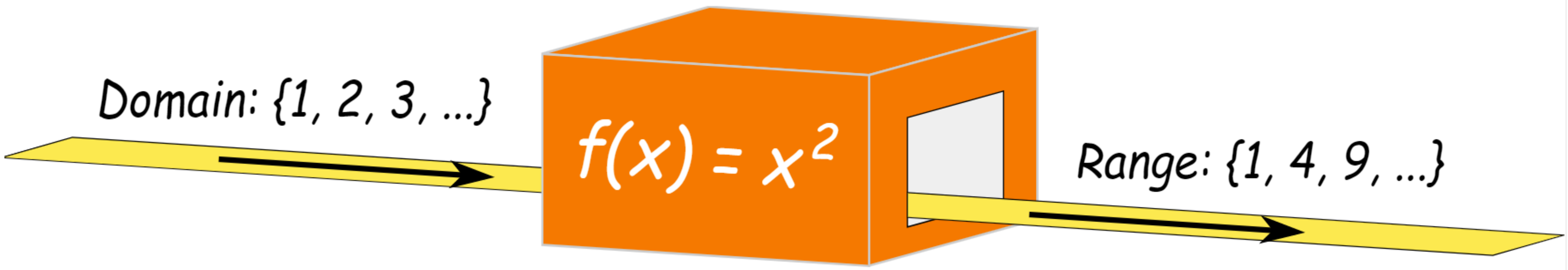
Find Dx for $y = x^2$

Solution   Dx: $-\infty < x < \infty$

- Range: The real value of y that gives real value of x.
- Example

Find Ry for $y = x^2$

Solution   Ry=$[0, \infty)$



1.2. Function and the Graphs(Cont.)

- **Example** Identifying Domain and Range
- Verify the domains and ranges of these functions.

Functions
$y = 1/x$
$y = \sqrt{x}$
$y = \sqrt{4 - x}$
$y = \sqrt{1 - x^2}$

1.2. Function and the Graphs(Cont.)

- Graphs of functions
- The graph of a function is the set of all points whose co-ordinates (x, y) satisfy the function $y = f(x)$. This means that for each x-value there is a corresponding y-value which is obtained when we substitute into the expression for f(x).
- Steps to graph a function

1. Make a table of xy-pairs that satisfy the function.
2. Plot the pair (x,y) where coordinate appear in the table
3. Draw a smooth curve through the plotted points.

- Example

Sketch these functions

$y = x^2$

$y = \frac{1}{x^2}$

$y = \sqrt[3]{x}$

1.2. Function and the Graphs(Cont.)

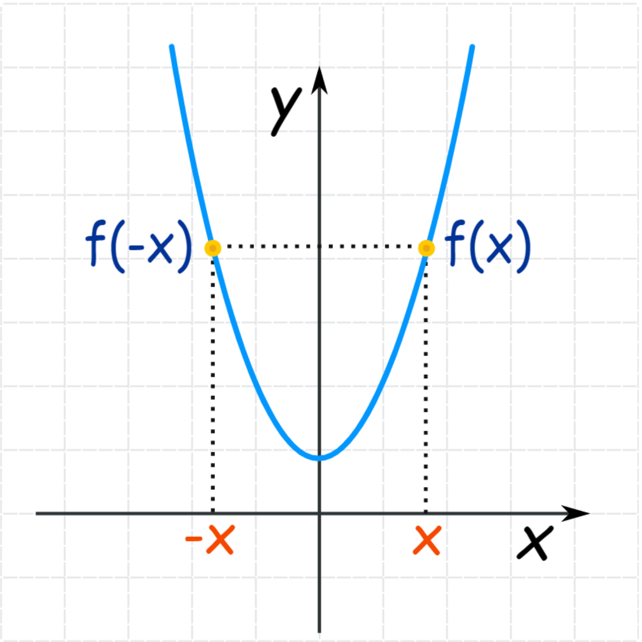
➢Even and odd functions

- *Even*
- A function is "even" when:

$f(x) = f(-x)$ for all x

  - in other words there is symmetry about the y-axis:
  - they got called "even" functions because the functions x^2, x^4, x^6, x^8, etc behave like that

Even

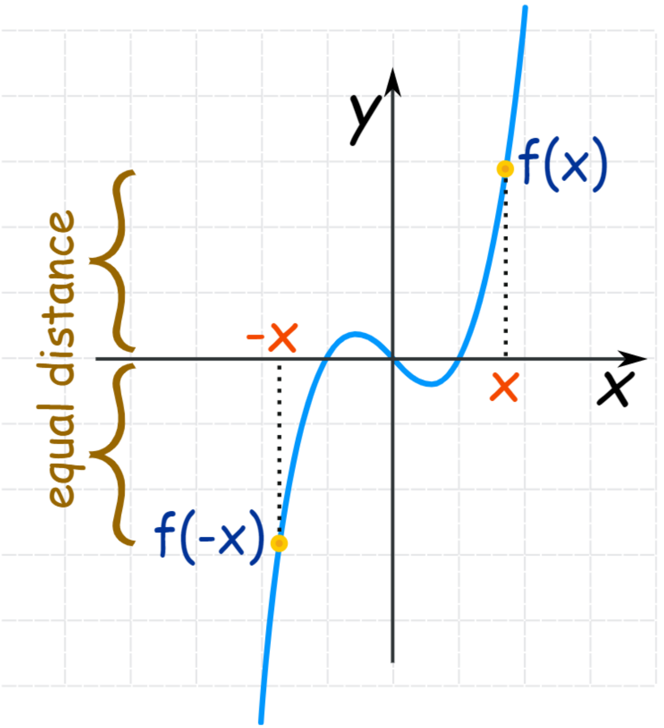


- *Odd*
- A function is "odd" when:

$-f(x) = f(-x)$ for all x

  - And we get origin symmetry:
  - They got called "odd" because the functions x, x^3, x^5, x^7, etc behave like that.

Odd



- *Neither Odd nor Even*
- in fact most functions are neither odd nor even.

1.2. Function and the Graphs(Cont.)

- Example

These functions are even or odd?

- $f(x) = x/(x^2-1)$
- $f(x) = 0$
- $f(x) =(x+1)^2$
- $f(x) = x^3+1$
- $f(x) = x+1$

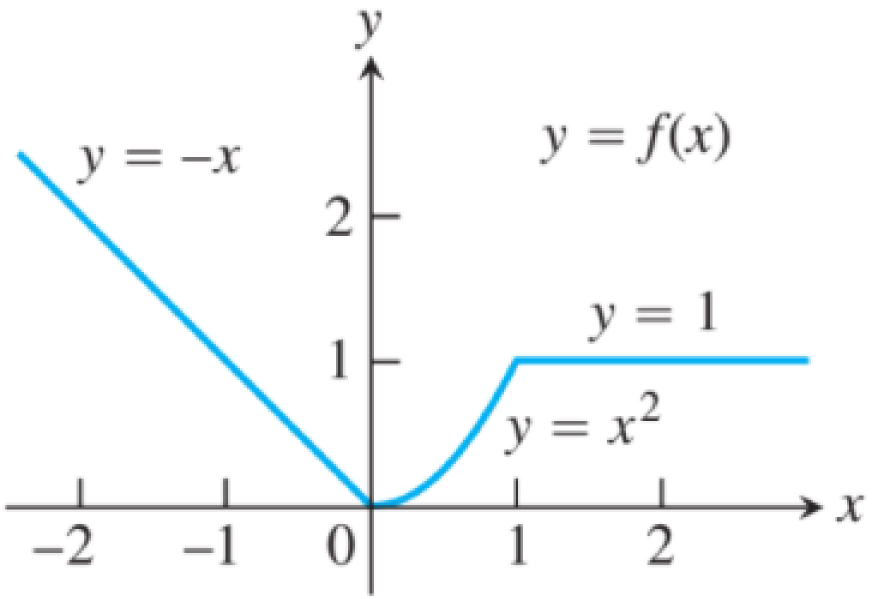
1.2. Function and the Graphs(Cont.)

- Functions defined in pieces:
- Some functions defined by single formula like

$$y = x, \quad y = x^3, \quad y = \sqrt{x}$$

- Others are defined by applying different formulas to different parts of their domain

$$y = f(x) = \begin{cases} -x & x < 0 \\ x^2 & 0 \le x \le 1 \\ 1 & x > 1 \end{cases}$$



1.2. Function and the Graphs(Cont.)

➢Integer-valued function

- The Greatest Integer Function
- The function whose value at any number x is the greatest integer less than or equal to x is called the greatest integer function or the integer floor function. It is denoted as $\lfloor x \rfloor$

- $\lfloor 2.4 \rfloor$ = 2, $\lfloor 1.9 \rfloor$ = 1, $\lfloor 0 \rfloor$ = 0, $\lfloor -1.2 \rfloor$ = -2,
- $\lfloor 2 \rfloor$ = 2, $\lfloor 0.2 \rfloor$ = 0, $\lfloor -0.3 \rfloor$ = -1, $\lfloor -2 \rfloor$ = -2.

For the next lecture we will learn:

- Function and their Graphs