

1) Write a goal for this class for the rest of the term.

2) Write at least 2 things you can do to reach your goal.

## 1.2 Functions and Properties

### Objectives:

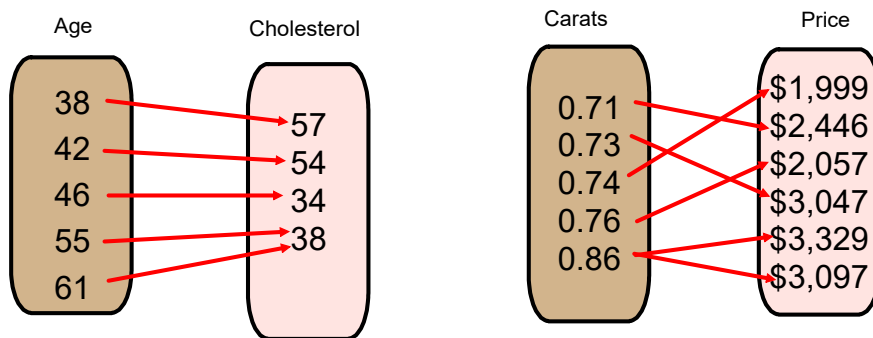
- 1) I can determine the domain and range of a function from the graph.
- 2) I can determine the domain of a function algebraically.
- 3) I can identify key features of a function. (max, min, inc, dec, etc.)

## What is a function?

Definition of a function: A function of a set  $D$  to a set  $R$  is a rule that assigns to every element in  $D$  a unique element in  $R$ . The set  $D$  of all input values is the **domain** of the function, and the set  $R$  of all output values is the **range** of the function.

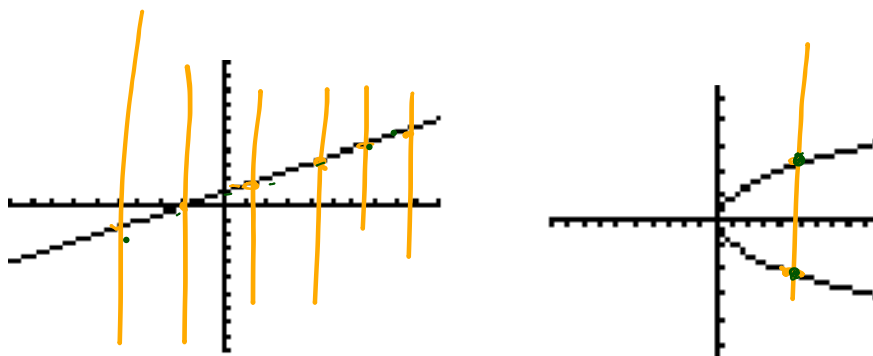
In other words...every  $x$ -value corresponds to only one  $y$ -value.

### Mapping



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### Graphically



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## Function Notation

$$y = f(x)$$

Evaluate

$$f(x) = x^2 + 6x$$

$$f(0) = (0)^2 + 6(0)$$

$$f(0) = 0$$

x	f(x)
0	0

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## Domain &amp; Range

**Domain:** x-values - input

read x's from left to right (smallest to largest)

( , )    [ , ]    ( , ]

★ some functions have domain restrictions

- can't have a neg. # in a sq. rootto find: set the radicand  $\geq 0$  and solve for x.- denominator cannot be 0

to find: set denominator = 0 and solve for x.

**Range:** y-values - output

read y's from bottom to top (smallest to largest)

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Examples:

~~(-∞, ∞)~~ Find the domain of the function.

$$f(x) = \sqrt{x+3}$$

$$\rightarrow x+3 \geq 0$$

$$x \geq -3$$

$$[-3, \infty)$$

$$g(x) = \frac{\sqrt{x}}{x-5}$$

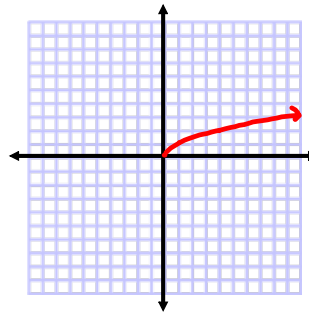
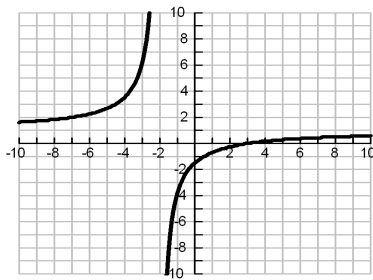
$$x \geq 0$$

$$x-5 \neq 0$$

$$x \neq 5$$

$$[0, 5) \cup (5, \infty)$$

Find the domain and the range of the function:



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$$f(x) = 3x - 7$$

$$(-\infty, \infty)$$

$$h(x) = \frac{\sqrt{4-x}}{(x+1)(x^2+1)}$$

$$4-x \geq 0$$

$$4 \geq x$$

$$x \leq 4$$

$$(x+1)(x^2+1) \neq 0$$

$$x+1 \neq 0 \quad x^2+1 \neq 0$$

$$x^2 \neq -1$$

$$x \neq -1$$

$$x \neq \sqrt{-1}$$

$$x \neq \pm i$$

$$(-\infty, -1) \cup (-1, 4]$$

$$\left. \begin{array}{l} \text{denom} \neq 0 \\ \sqrt{\quad} \geq 0 \end{array} \right) h(x) = \frac{5}{\sqrt{x+7}}$$

$$\sqrt{x+7} \neq 0^2$$

$$x+7 \neq 0$$

$$\underline{x \neq -7}$$

$$x+7 \geq 0$$

$$\underline{x \geq -7}$$

$$\underline{(-7, \infty)}$$

$$g(x) = \frac{\sqrt{x+1}}{(x+7)(x-1)} \neq 0$$

$$x+1 \geq 0$$

$$\underline{x \geq -1}$$

$$(x+7)(x-1) \neq 0$$

$$x+7 \neq 0$$

$$x-1 \neq 0$$

$$\underline{x \neq -7}$$

$$\underline{x \neq 1}$$

$$\underline{[-1, 1) \cup (1, \infty)}$$

$$h(x) = \frac{\sqrt{4-x^2}}{x-3}$$

$$4 - x^2 \geq 0$$

$$4 \geq x^2$$

$$\sqrt{x^2} \leq \sqrt{4}$$

$$\underline{x \leq 2}$$

$$\underline{x \geq -2}$$

$$x - 3 \neq 0$$

$$\underline{x \neq 3}$$

$$[-2, 2]$$

## Extrema

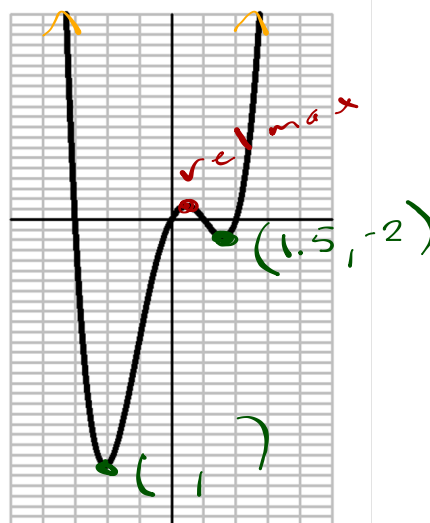
These are **points** where a graph is at a maximum or minimum height.

maximums

- relative (local)
- absolute (global)

minimums

- relative (local)
- absolute (global)



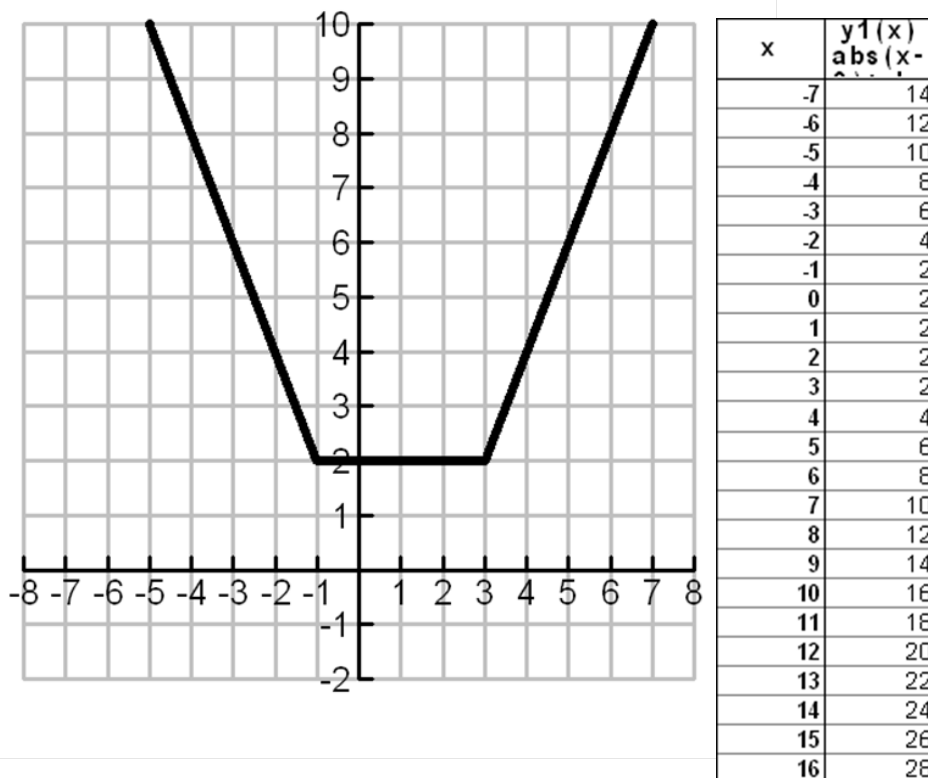
## Increasing, Decreasing and Constant

- Increasing: as you move from left to right the y-values increase
- Decreasing: as you move from left to right the y-values decrease
- Constant: as you move from left to right the y-values do not change

this behavior is reported using interval notation for the **X-VALUES** where the graph has a certain behavior

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Where is the graph increasing, decreasing and constant?



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