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.)

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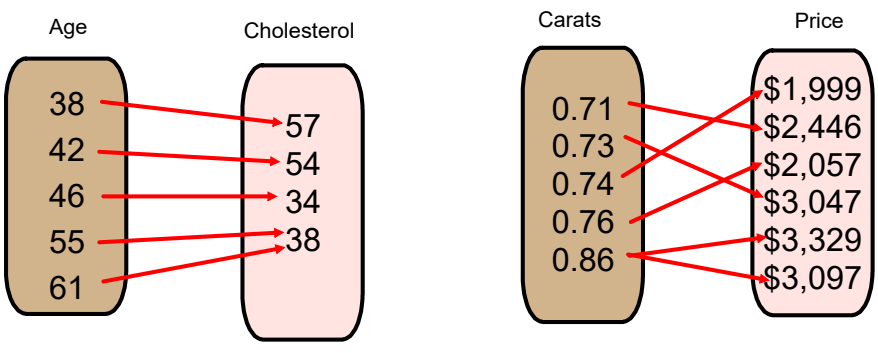
What is a function?

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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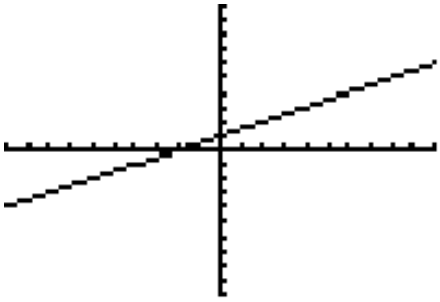
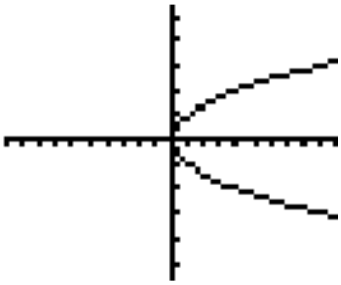
Graphically





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Function Notation

$$y = f(x)$$

Evaluate

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

x	f(x)

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Domain & 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. root
to find: set the radicand ≥ 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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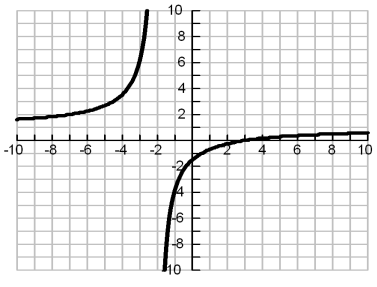
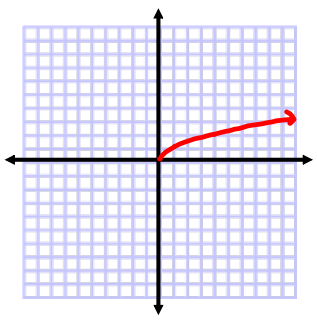
Examples:

Find the domain of the function.

$$f(x)=\sqrt{x+3} \qquad g(x)=\frac{\sqrt{x}}{x-5}$$

Find the domain and the range of the function:





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Continuity

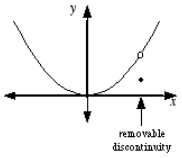
A function *f* is **continuous at x = a** if $\lim_{x \to a} f(x) = f(a)$.

In other words...you can draw it in one motion without picking up your pencil.

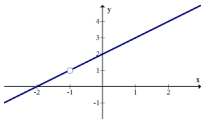
Types:

Removable Discontinuity

(can be "patched")

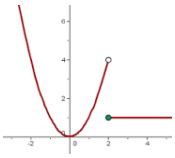


or

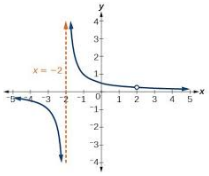


Jump Discontinuity

(not removable)



Infinite Discontinuity



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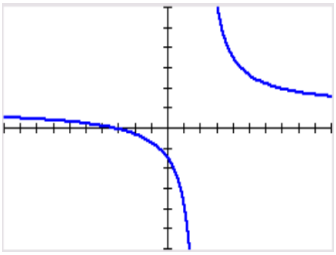
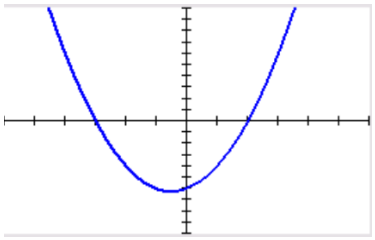
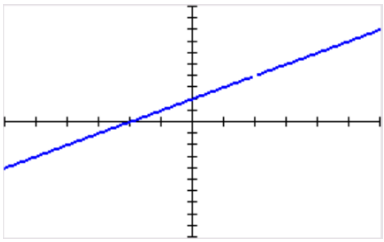
Identifying Points of Discontinuity

$$f(x) = \frac{x+3}{x-2} \qquad g(x) = (x+3)(x-2) \qquad h(x) = \frac{x^2-4}{x-2}$$







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Extrema

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

maximums
- relative (local)
- absolute (global)

minimums
- relative (local)
- absolute (global)

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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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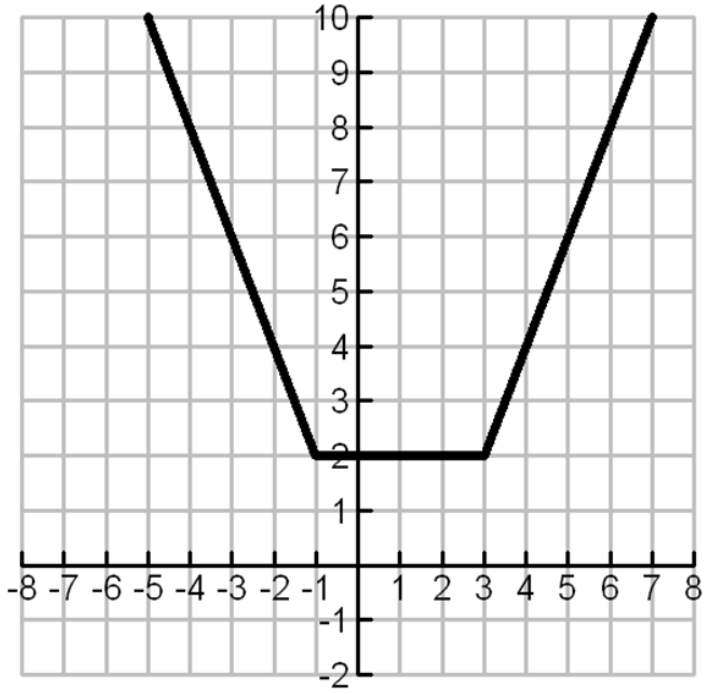
Where is the graph increasing, decreasing and constant?



x	y1(x) abs(x-
-7	14
-6	12
-5	10
-4	8
-3	6
-2	4
-1	2
0	2
1	2
2	2
3	2
4	4
5	6
6	8
7	10
8	12
9	14
10	16
11	18
12	20
13	22
14	24
15	26
16	28

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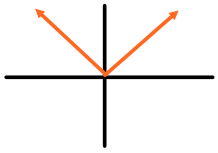
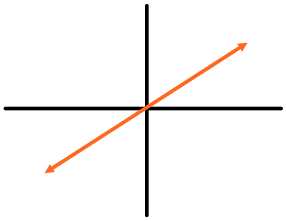
Symmetry: Even/Odd/Neither

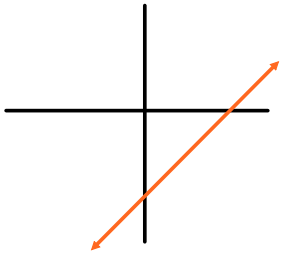
Even: If the graph is symmetric to the y-axis, it is an even function



Odd: If the graph is symmetric to the origin , it is an odd function



Neither: If it doesn't fit either odd or even, then it is neither



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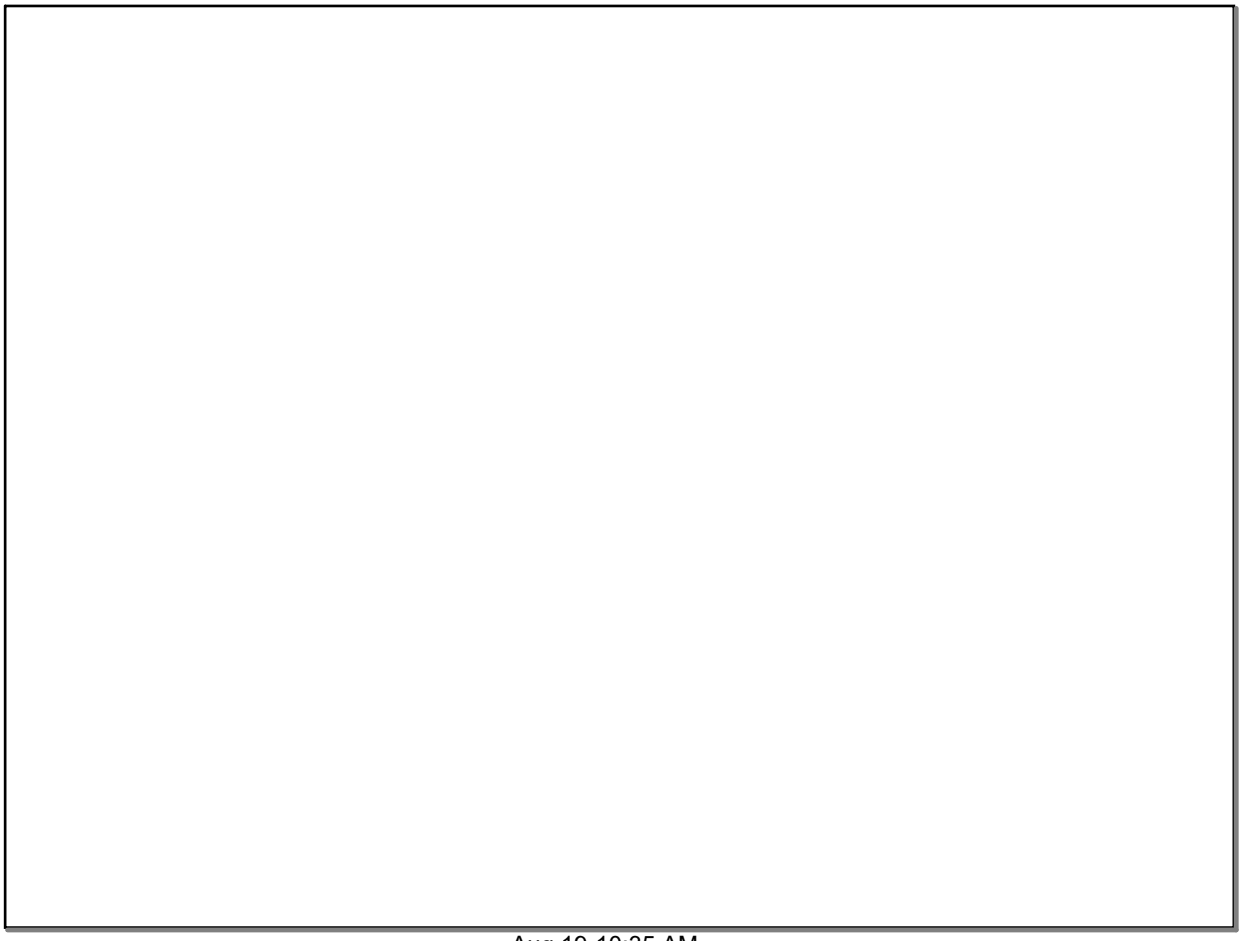

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