Today's lesson and objectives

Functions

- Identify relations between two variables and determine if they are functions
- Use function notation and evaluate functions
- Determine the domain of a function
- Model problems with functions

Functions

- A ***function f*** from set A to set B is a rule that to each element (INDEPENDENT) of the set A assigns EXACTLY one element of the set B (DEPENDENT).

- Set A is called the ***domain*** of *f*, while B is called the ***range*** of *f.*

Different ways to describe a function

- Verbally – sentence describing how the dependent and independent variable are related

- Numerically – using a table or list of ordered pairs

- Graphically – drawing all the ordered pairs on a coordinate system (the independent variable corresponds to the horizontal axis, and dependent to vertical)

- Algebraically – writing an expression that describes how one variable depends on the other

Are these functions? Find the domains and ranges.

- There are 120 students in the class M1050.

- To each student in the class M1050 we associate their grade on the final exam.

Domain:
Range:
Function: yes no

- To each score 1 to 100 we associate a student with that score.

Domain:
Range:
Function: yes no

other number

Are these functions? Find the domains and ranges.

- {(1,2), (1,3),(2,4),(2,5),(3,6),(3,7)

  Domain:
  Range:
  Function: yes no

- {(2,8),(3,7), (4,6),(5,7),(6,8)}

  Domain:
  Range:
  Function: yes no

Is this a function? Find the domain and range.

x	y
1	13
2	21
3	17
3	17
4	12
5	15

Is this a function? Find the domain and range.

- Is y a function of x if we have $3x + 5y = 2$
- Question: **“Do we have only one y for each x?**

To find that out we should express y in terms of x, and see if we get a unique (only one) value of y for each individual x:

Is this a function? Find the domain and range.

- Is x a function of y? We have $3x + 5y = 2$
- Question: **"Do we have only one x for each y?"**

To find that out we should express x in terms of y, and see if we get a unique (only one) value of x for each individual y:

Function notation and evaluating functions

$$g(x) = 2x + 4$$

Evaluate function
g at 2, 4, -3, 1/2

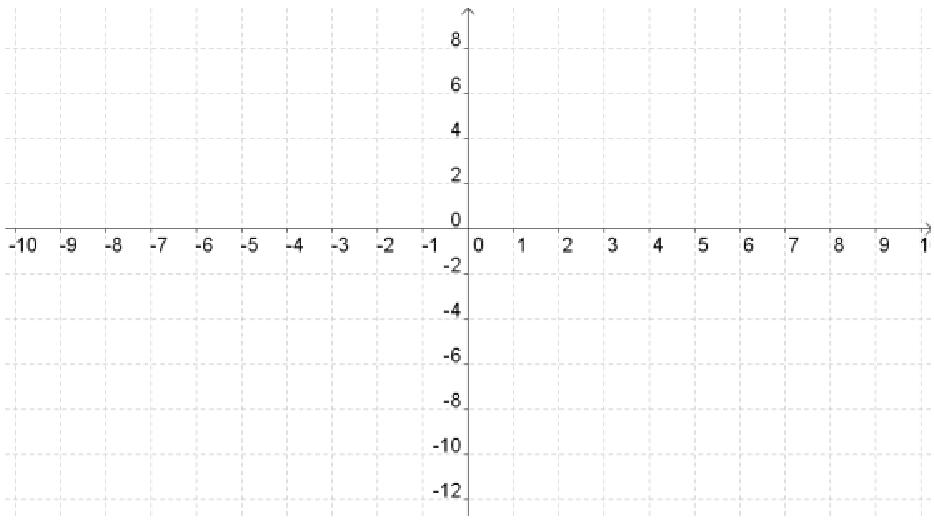
Piecewise defined functions

$$f(x) = \begin{cases} x^2 - 1, & x \leq 3 \\ x + 3, & x > 3 \end{cases}$$

- Evaluate *f* at 6, -12 and 0
- Draw a table of values for x∈[-1, 5]

$$f(x) = \begin{cases} x^2 - 1, & x \leq 3 \end{cases}$$

x	f(x)
-1	
0	
1	
2	
3	
4	
5	



Find the domains of the following functions

$$g(x) = \sqrt{1-2x}$$

Find the domains of the following functions

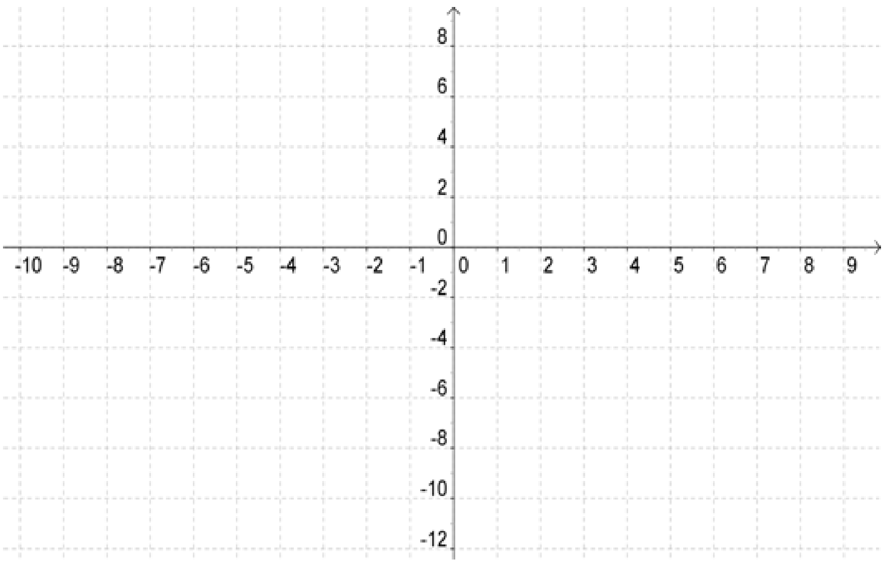
$$h(s) = \frac{s(s+3)}{(s-2)(s+4)}$$

Find the domains of the following functions

$$h(x) = \sqrt[3]{1-2x}$$

Graph of a function f is the set of all points *(x, f(x))* in the coordinate plane.

- Graph $f(x)=2x-1$



What can the graph tell us?

- Can I read the value of a function at a given point?

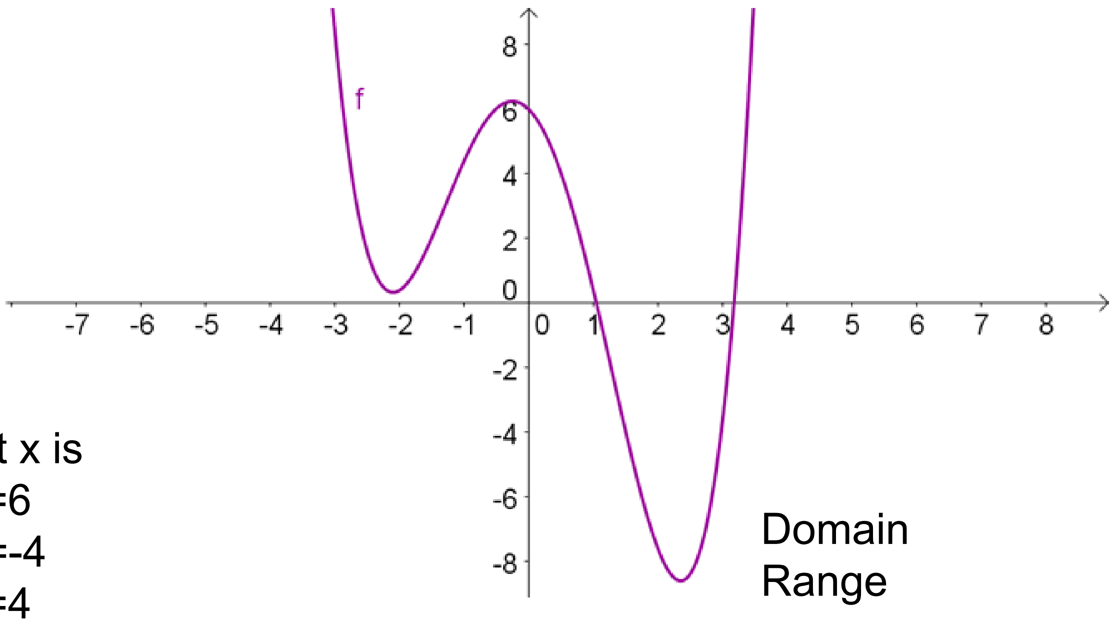
- If I know the value of the function, can I find its origin (the value of independent variable this value corresponds to)?

- Can I read the domain and range?

What can the graph tell us?

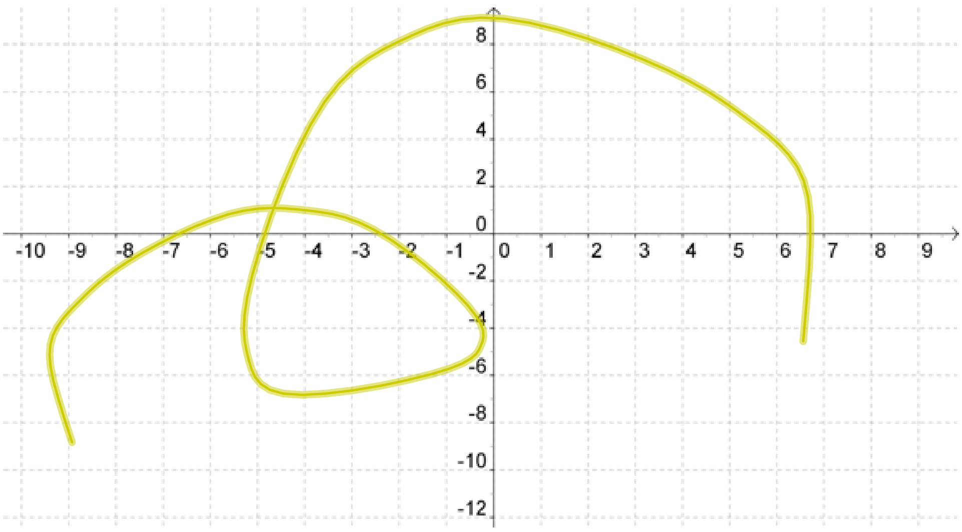
f(1) =
f(0)=
f(-1)=

For what x is
- f(x)=6
- f(x)=-4
- f(x)=4



Domain
Range

Is this a function? Find its domain and range



Vertical line test

- A curve in the plane is a graph of a function of *x* only if every vertical line intersects that curve in at most one point.

Review

- Let the function *f* be defined by $f(x) = \frac{1}{\sqrt{1-x^2}}$

- Indicate whether the following statements are true or false:

1. *f(x)* is never positive.
2. *f(x)* is never zero.
3. 0 is in the domain of *f*
4. All negative real numbers are in the domain of *f*
5. All positive real numbers are in the domain of *f*
6. 1 is in the domain of *f*
7. *f* is never negative.

http://matti.usu.edu/grapher/