

1.1&1.2^{Spring 2011}

- OBJECTIVES:**
1. To determine if a relation is a function
 2. To use function notation
 3. To find the domain and range of a function
 4. To use mathematical models.
 5. To graph functions by hand and with a graphing utility
 6. To graph scatter plots

You must read pages 2-7 on your own. You must do the Course Compass homework for this material. Make sure to show all work neatly in a notebook. One quiz question.

Function- A function is a rule or correspondence that assigns to each element of one set (called the **domain-input**) one and only one element of the second set (called the **range-output**).

The function may be defined by a set of ordered pairs, a table, a graph, or an equation.

Ordered pairs: Which of the following are functions?

1. $\{(0, 1), (1, -2), (2, 0), (3, 2)\}$
2. $\{(0,0), (1, 0), (2, 0), (3, 0)\}$
3. $\{(0, -1), (2, 2), (1, -2), (3, 0), (1, 1)\}$

Name the domain and range of each **function**?

Table: Which of the following are functions?

Input (x)	0	3	9	12	15
Output (y)	3	3	3	3	3

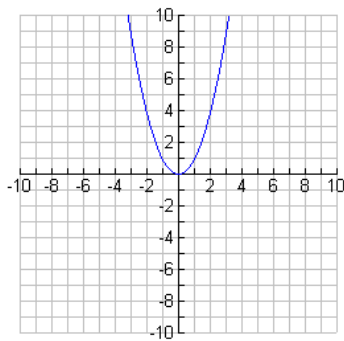
Input (x)	10	7	4	7	10
Output (y)	3	6	9	12	15

1.

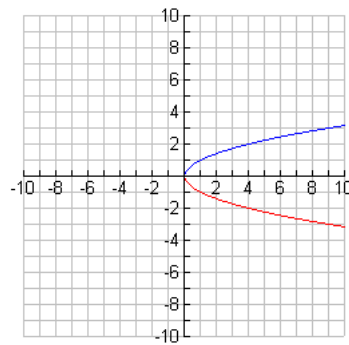
2.

Graph:

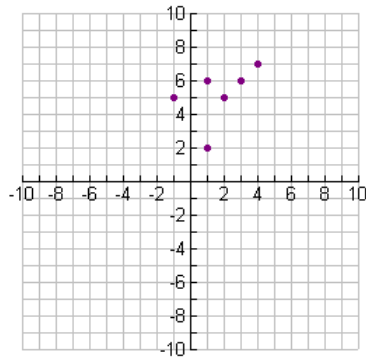
Which of the following are functions?



1.



2.



3.

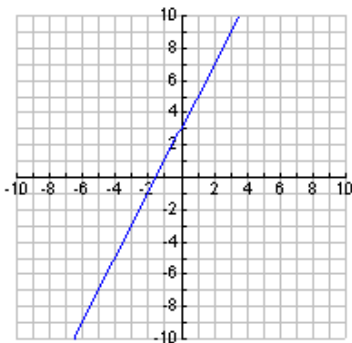
How can you determine if a graph is a function?

Vertical Line Test

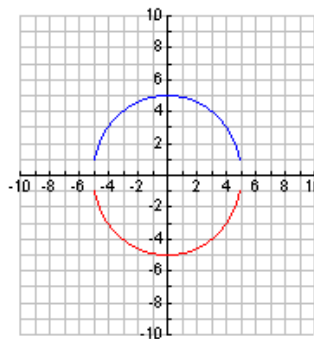
A set of points in a coordinate plane is the graph of a function if and only if no vertical line intersects the graph in more than one point.

Equation: Which of the following are functions?

1. $y = 2x + 3$



2. $x^2 + y^2 = 25$



Function Notation

When an equation is used to represent a function, it is convenient to name the function so that it can be identified as a function easily. When an equation represents a function we use $f(x)$, $g(x)$, $h(x)$ etc. instead of y .

In the example above we determined that $y = 2x + 3$ is a function. Therefore we can write this function using function notation as:

$$f(x) = 2x + 3$$

Given the following function find the $f(x)$ (y) values of the specified x values.

1. $f(x) = x^2 - 12$ $x = 5,$ $x = -4$

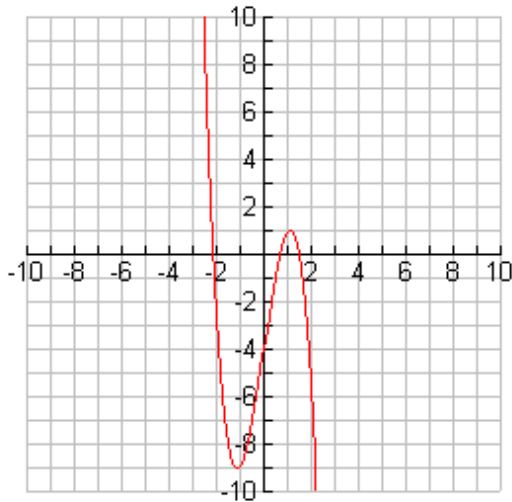
2.

$$f(x) := \begin{cases} x^2 + 4 & x < 2 \\ x & x \geq 2 \end{cases}$$

"Done"

$x = 2,$ $x = -3$

The figure below shows the graph of $f(x) = -2x^3 + 7x - 4$



Use it to determine each of the following.

1. $f(0) = \underline{\hspace{2cm}}$

2. $f(-2) = \underline{\hspace{2cm}}$

3. $f(\underline{\hspace{1cm}}) = 1$

How a function is defined determines its domain and range. For example the domain of our first table is the finite set $\{0, 3, 9, 12, 15\}$.

Input (x)	0	3	9	12	15
Output (y)	3	3	3	3	3

The domain of the graph above is the set of real numbers.

If the domain of a function is not specified or restricted by the problem then it is assumed to be the set of all real numbers that gives a real number output.

What is the domain of each of the following functions?

1. $f(x) = \sqrt{x-5}$ 2. $f(x) = \frac{3}{x+5}$ 3. $f(x) = x^2$

Determine whether the given relationship determines a function.

1. The circulation of morning newspaper a function of the year?
2. The weight of a child at his annual checkup.
3. The balance in a checking account on any given day.

A **Mathematical model** is a functional relationship that includes not only the function but also descriptions of all variables involved in the problem and their units.

Example #62

The profit from the production and sale of i-pod players is given by the function $P(x) = 450x - 0.1x^2 - 2000$, where x is the number of units produced and sold.

a) What is $P(500)$? Interpret the results?

b) What is the profit from the production of 4000 units?
Write this in function notation.

Example #49

If a couple wants to buy a \$35,000 car and can borrow the money for the purchase at 8%, paying it off in 3, 4 or 5 years. The table below gives the monthly payments and the total cost of the purchase (including the loan) for each of the payment plans.

T (years)	Monthly payment \$	Total Cost (\$)
3	1096.78	39,484.08
4	854.46	41,014.08
5	709.68	42,580.80

Suppose that when the payment is over t years, $P(t)$ represents the monthly payment and $C(t)$ represents the total cost for the car and loan.

- Find $P(3)$, and write a sentence that explains its meaning.
- What is the total cost of the purchase if it is financed over five years? Write the answer using function notation.
- What is t if $C(t) = 41,014.08$?
- How much money will the couple save if they finance the car for 3 years rather than 5 years?

EXAMPLE #68 Suppose the number of units of a product that is demanded by consumers is given as a function of p by $q = \frac{100}{\sqrt{2p + 1}} - 1$ where p is the price charged per unit.

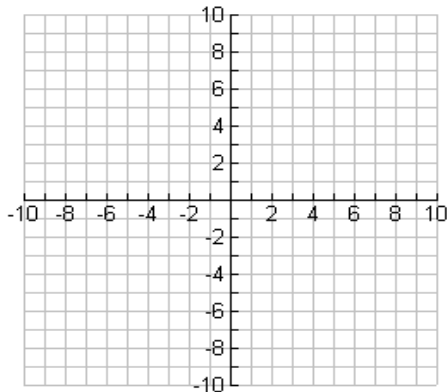
- What is the domain of the function defined by this equation?
- What should the domain and range of this function be to make sense in this application?

Complete Graph:

A graph is a **complete graph** if it shows the basic shape of the graph and important points on the graph (including points where the graph crosses the axes and points where the graph turns), and suggests what the unseen portions of the graph will be.

EXAMPLE: Show a complete graph of $y = -x^2 + 9$ by plotting points (hand).

x	-3	-2	-1	0	1	2	3
y							

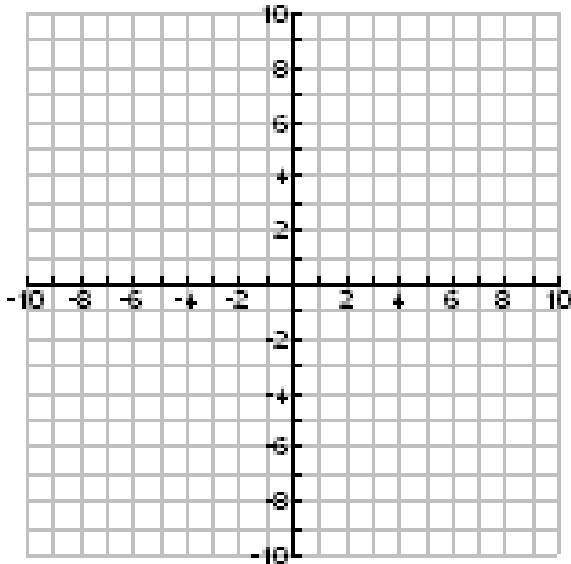


EXAMPLE: Graph $y = x^3 + 4x^2 - 15$ using your TI-83 Plus.

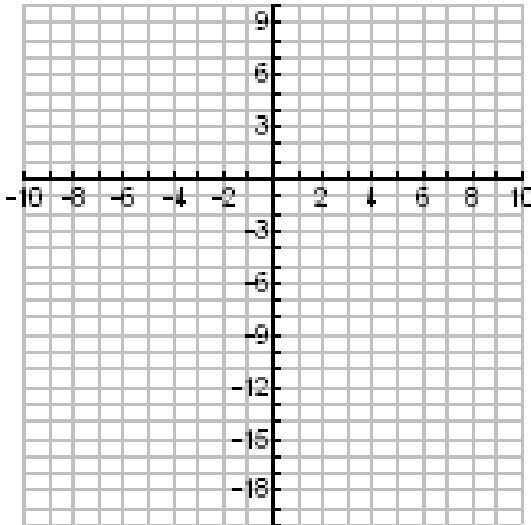
1. Solve for y, if necessary.
2. Enter the function as Y_1
3. Press ZOOM 6 for the Standard Viewing Window. The calculator will automatically set the x and y axes to range -10 to 10.
4. If you do not have a complete graph, you might need to adjust the window. Press WINDOW and adjust as needed. Then press Graph.

Now let's graph our function in a standard viewing window. Sketch on the graph below.

Is this a complete graph?



Let's change our window. Change the y minimum to see more of the graph (change it to -20). Sketch it on the graph below.



Use your calculator to find the turning points.

Example: Find an appropriate viewing window for the function for x between -60 and 0.

$$y = x^2 + 60x + 30.$$

Aligned inputs-are simply input values that have been converted to smaller numbers by subtracting the same number from each input.

EXAMPLE: #30

The cost of prizes and expenses of state lotteries is given by $L = 35t^2 + 740t + 1207$ million dollars, with t equal to the number of years after 1980.

a. What are the values of t that correspond to the years 1982, 1988, and 2000?

b. $P = f(4)$ gives the value of P for what year?
What is $f(4)$?

c. What x_{\min} and x_{\max} should be used to set a viewing window so that t represents 1980-1997?

SCATTER PLOTS

EXAMPLE: (#54) The table below gives the national monthly health insurance premiums paid by employers and employees for the years 2000-2004

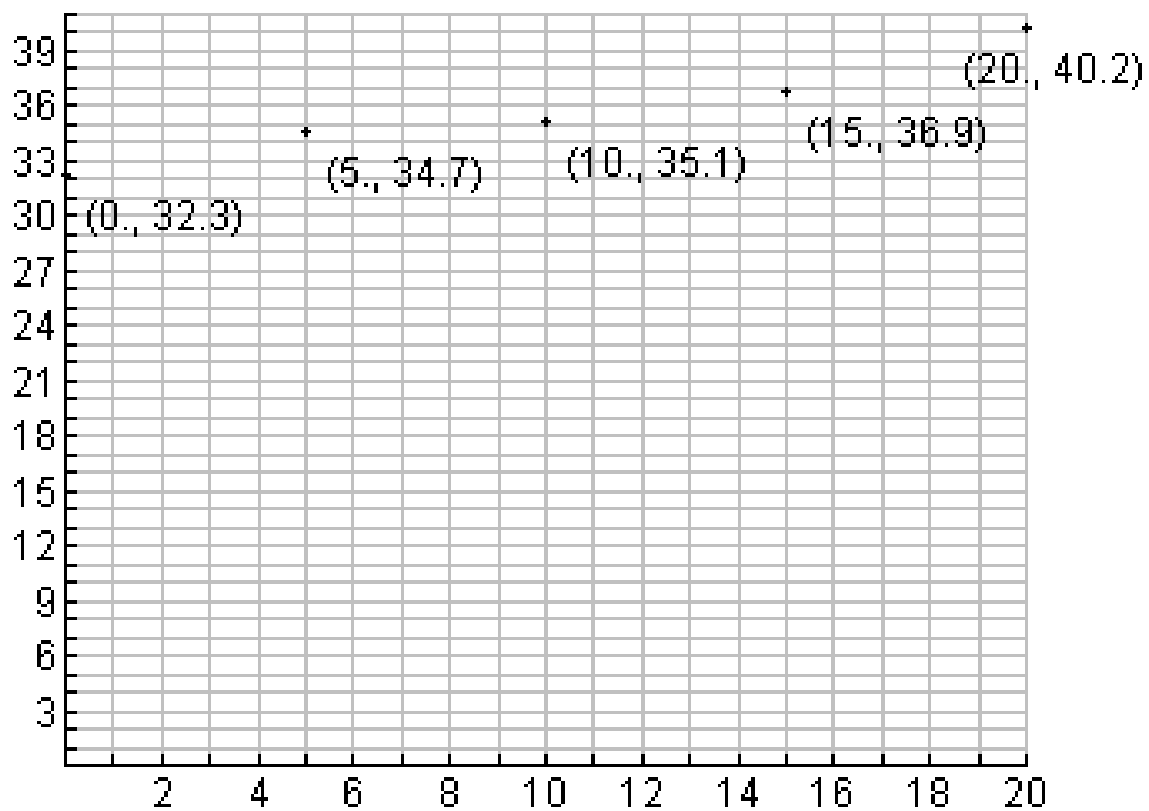
a. Let x represent the number of years from 2000 and y represent the monthly premium in dollars. Sketch the scatter plot of the data.

b. Graph the equation $y = 5.00x^2 + 21.91x + 378.60$ on the same axes as the scatter plot.

Year	# of years since 2000 x 2000(x)	Monthly premium (\$)(4)Premiums(4)
2000	0	379.72
2001	1	401.20
2002	2	448.42
2003	3	485.42
2004	4	547.29

To create a Scatter plot:

1. Enter to data into lists. Press STAT. Press 1(EDIT)
If your list are not empty, clear them out by putting the cursor at the name at the top of the list and press **CLEAR**.
Enter the x values into List 1 and the y values into List 2
2. Turn off any function on the y = Menu. In the y = screen, put the cursor on the function and press CLEAR.
3. Turn on a Stat Plot 2nd- STAT PLOT-#1:- enter. At this point you are in Plot 1. To turn Plot 1 on, put the cursor on the word “on” and hit ENTER. There are 6 “types” shown. Put the cursor on the first type (which is a scatter plot) and hit ENTER.
4. To see the scatter plot, enter Zoom 9. This is the function used to graph statistics pictures.



HOMEWORK:

Course Compass-Algebra Toolbox and section 1.1 & 1.2
Book problems from 1.1 page 19 # 1, 3, 19, 55, 58, 66 and
1.2 page 39 #15, 33, 44, 47, 56

This assignment is due _____