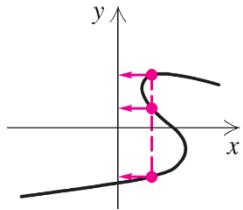**Date:**   **Section:**

Objective:

Not every collection of points in the *xy*-plane represents a function. Remember, for a function, each number *x* in the domain has exactly one image *y* in the range. The graph of the function must satisfy the *vertical line test*.
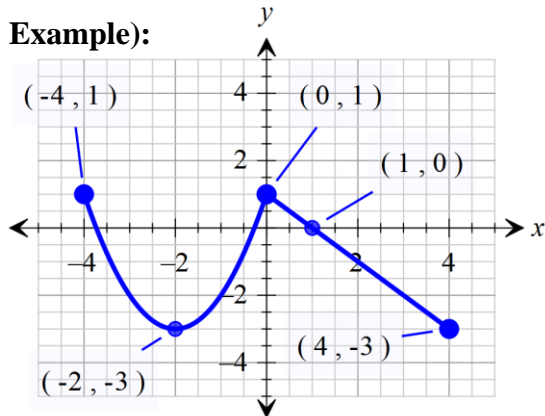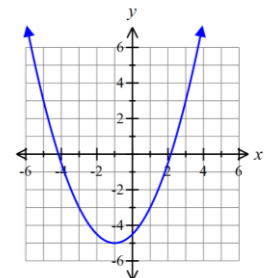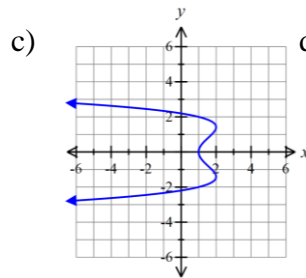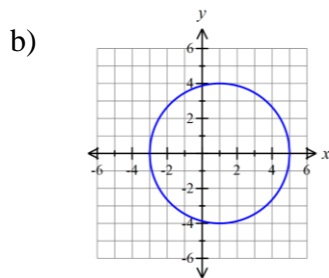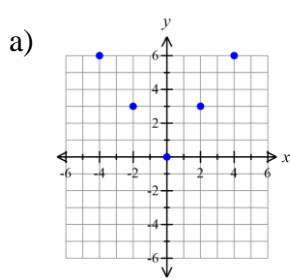
Vertical Line Test

If it is possible for a vertical line to cross a graph more than once, then the graph is not the graph of a function.

The graph at left is not a function because three *y*-values correspond to one *x*-value.

Examples: Decide whether each graph represents a function. Then find the domain and range. Discuss Symmetry.

a)   b)   c)   d)

Example):

(-4, 1)   4   (0, 1)

2   (1, 0)

-4   -2   2   4

-2

(4, -3)

-4

(-2, -3)

a) Find $f(0)$ and $f(-4)$.

b) Is $f(3)$ positive or negative?

c) Is $f(-2)$ positive or negative?

d) For what values of x is $f(x)=0$?

e) For what values of x is $f(x)>0$?

f) What is the domain of f ?

g) What is the range of f ?

h) What are the *x*-intercepts?

i) What is the *y*-intercept?

j) How often does the line $y=1/2$ intersect the graph?

k) How often does the line $x=5$ intersect the graph?

l) For what values of x does $f(x)=-2$?

Example: $f(x) = \frac{x^2+2}{x+4}$

a) Is the point $\left(1, \frac{1}{3}\right)$ on the graph of f?

b) If $x = 0$, what is $f(x)$? What point is on the graph of f?

c) If $f(x) = \frac{1}{2}$, what is x? What point(s) are on the graph of f?

d) What is the domain of f?

e) List the x-intercepts, if any, of the graph of f.

f) List the y-intercept, if there is one, of the graph of f.

Example: A golf ball is hit with an initial velocity of 130 feet per second at an inclination of 45° to the horizontal. In physics, it is established that the height, h, of the golf ball is given by the function $h(x) = -\frac{32x^2}{130^2} + x$, where x is the horizontal distance that the golf ball has traveled is.

a) Determine the height of the golf ball after it has traveled 100 feet, 300 feet, and 500 feet.

b) How far was the golf ball hit?

c) Using a graphing calculator, graph the function $h(x)$.

d) How far has the ball traveled when it reaches its maximum height? What is its maximum height?