

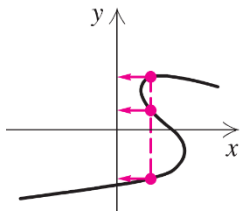
SM 3H

Date: 9/26/23 Section: 2.2

Objective: I can analyze a graph, equation and story.

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*.

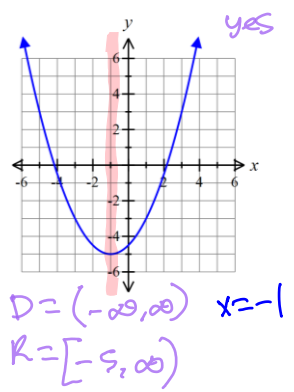
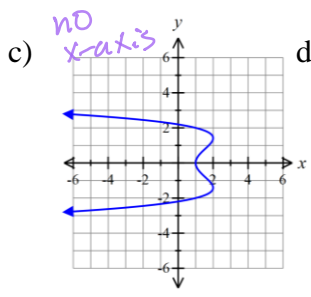
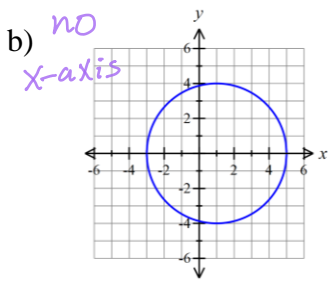
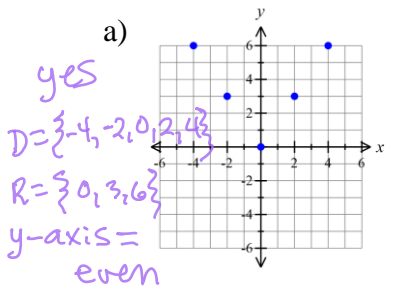
Vertical Line Test



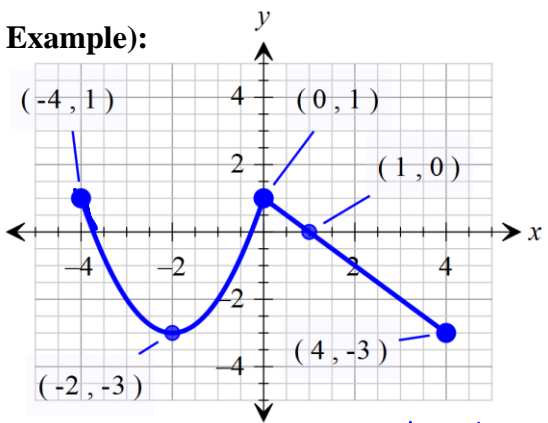
If it is possible for a vertical line to cross a graph more than once, then the graph is not the graph of a function.

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.



Example):



- a) Find $f(0)$ and $f(-4)$. $f(-4) = 1$
x=0 y=1
- b) Is $f(3)$ positive or negative? *negative*
- c) Is $f(-2)$ positive or negative? *negative*
- d) For what values of x is $f(x) = 0$?
 $y = 0 \quad x = -3.75, -2.25, 1$
- e) For what values of x is $f(x) > 0$?
 $[-4, -3.75) \cup (-2.25, 1)$

- f) What is the domain of f ? $[-4, 4]$
- g) What is the range of f ? $[-3, 1]$
- h) What are the x -intercepts? $(-3.75, 0), (1, 0), (-2.25, 0)$
- i) What is the y -intercept? $(0, 1)$
- j) How often does the line $y = 1/2$ intersect the graph? 3
- k) How often does the line $x = 5$ intersect the graph? 0
- l) For what values of x does $f(x) = -2$?
 $-3, -1, 3$

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

a) Is the point $(1, \frac{1}{3})$ on the graph of f ? $\frac{1^2+2}{1+4} = \frac{3}{5}$ *NO*

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

$\frac{0^2+2}{0+4} = \frac{1}{2}$ $(0, \frac{1}{2})$

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

① $\frac{1}{2} = \frac{x^2+2}{x+4}$ $(x+4)$ ② $x+4 = 2x^2+4$ ④ $x(2x-1) = 0$
 ③ $2x^2-x = 0$ ⑤ $x = 0, \frac{1}{2}$

d) What is the domain of f ?

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

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

$(x+4)(0 = \frac{x^2+2}{x+4})$ $0 = x^2+2$ *none*
 $x^2 = -2$

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

$(0, \frac{1}{2})$

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.

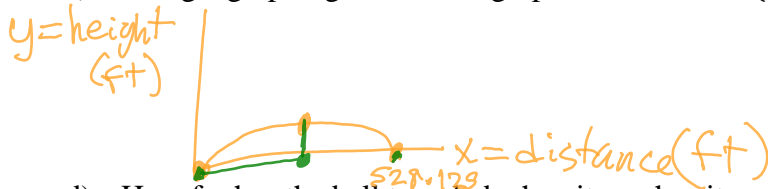
a) Determine the height of the golf ball after it has traveled 100 feet, 300 feet, and 500 feet.

$\frac{-32(100)^2}{130^2} + 100 \approx 81.07 \text{ ft.}$

b) How far was the golf ball hit? $x = ?$

$(0 = -\frac{32x^2}{130^2} + x)$ 130^2 $0 = -32x^2 + 130^2x$
 $-x(32x - 130^2) = 0$
 $x = 0, 528.125 \text{ ft}$

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?

$x = \frac{-b}{2a} = \frac{-1}{2(-\frac{32}{130^2})} \approx 263.75 \text{ ft}$ $\frac{-32(263.75)^2}{130^2} + 263.75 = y$
 $y = 132.03 \text{ ft.}$