



Real Numbers, Relations, and Functions

REAL NUMBERS

$$\sqrt{9} = 3$$

Rational Numbers
Examples: $\frac{1}{2}, \frac{1}{3}, .33$

Irrational Number
Examples: $\pi, \sqrt{2}, \sqrt{3}, \sqrt{5}, \sqrt{7}$
 $e, \sqrt{11}$

Integers
Examples: $\dots -3, -2, -1, 0, 1, 2, 3, \dots$

Whole Numbers
Examples: $0, 1, 2, 3, \dots$

Natural / Counting
Examples: $1, 2, 3, 4, \dots$

Examples:

A. List all of the whole number that are greater than -2. $\{0, 1, 2, 3, \dots\}$

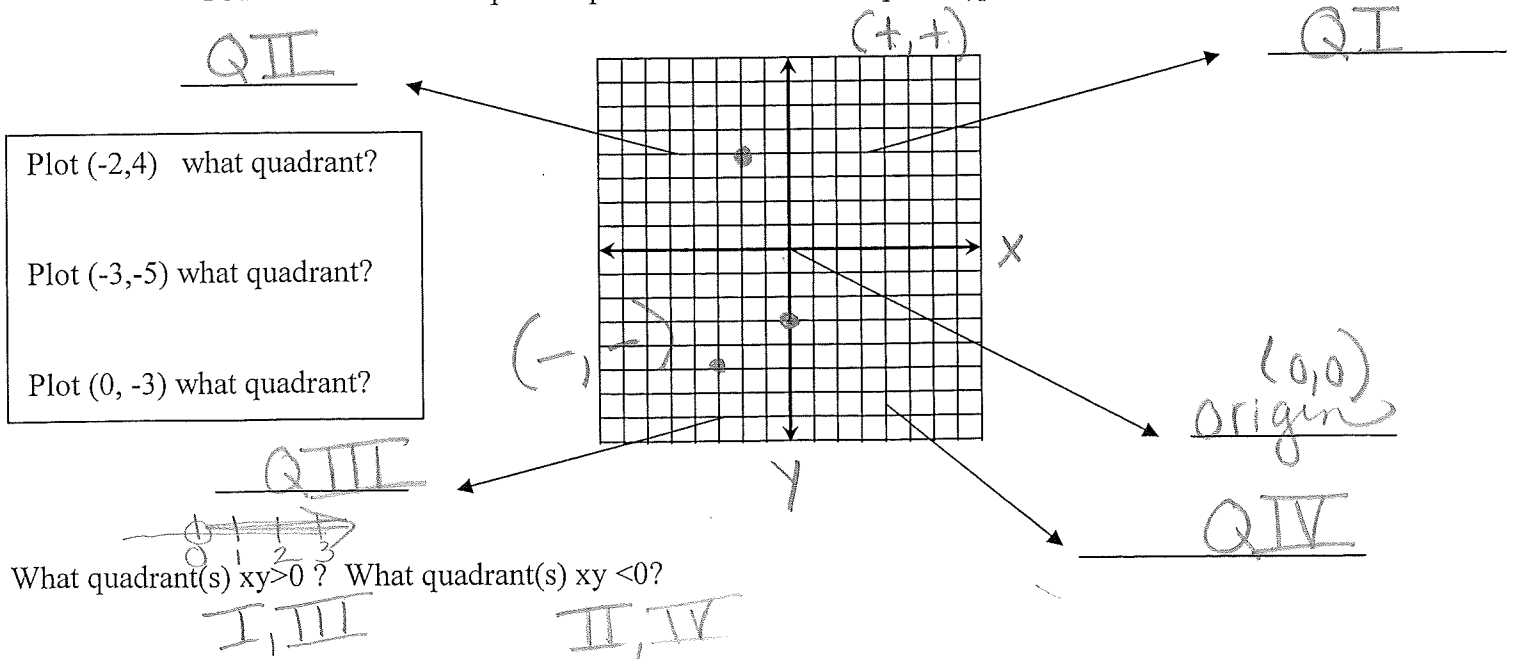
B. Classify -7.
integer, rational, real

$$\frac{9}{3} = 3$$

II. Coordinate Plane

Also known as (A.K.A.) The Rectangular Coordinate System or Cartesian System

- You must know the important parts of the coordinate plane (quadrants, how to plot ordered pairs etc)



III. Domain and Range

least \rightarrow greatest
Do not repeat!

Domain: the set of "x" values or inputs

Range: the set of "y" values or outputs

Given:

x	y
-3	4
-2	6
-1	0
3	9

name the domain:

name the range:

$\{-3, -2, -1, 3\}$
 $\{0, 4, 6, 9\}$

Given: $\{(-4, 6), (-3, 7), (-2, -2), (-2, 1), (0, 3)\}$

Name the domain:

Name the range:

$\{-4, -3, -2, 0\}$
 $\{-2, 1, 3, 6, 7\}$

Given: $\{(-3, 5), (2, -1), (3, 5), (-2, 5)\}$

Name the domain:

Name the range:

$\{-3, -2, 2, 3\}$ $\{-1, 5\}$

x	y
-2	3
± 3	4
4	0
9	-3

Name the domain:

Name the range:

$\{-3, -2, 3, 4, 9\}$
 $\{-3, 0, 3, 4\}$

IV. Relations and Functions

All sets of ordered pairs are called RELATIONS!!!

A FUNCTION is a "special type of a function" in which for every "x" or input there is only 1 "y" value or output!
(hint...if the x value repeats...the relation is NOT a function!)

Example: $\{(1, 2), (2, 2), (3, 2)\}$ is a function because the inputs are not repeated

$\{(1, 2), (1, 3), (1, 4)\}$ is NOT a function because the inputs are repeated

Evaluating a function:

Instead of $y = 2x + 3$, you will see function notation $f(x) = 2x + 3$

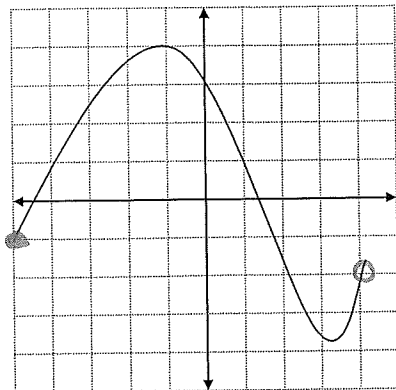
Example: Evaluate $f(3) = 2x + 3$

$$2(3) + 3$$

$$6 + 3$$

$$f(3) = 9$$

Interval notation:



State the domain:

State the range:

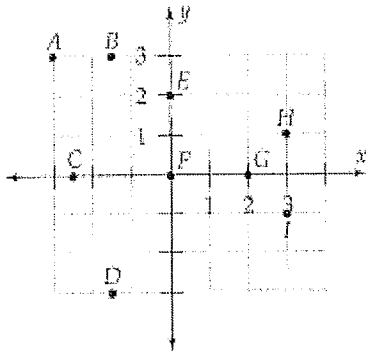
What is $f(-1) =$

What is $f(x) = -3$

1.1 Homework

Name _____

1. Find the coordinates of points A–I.



In Exercises 6–8, sketch a scatter plot of the given data. In each case, let the x -axis run from 0 to 10.

7. The table shows projected sales, in thousands, of personal digital video recorders. Let $x = 0$ correspond to 2000. (Source: eBrain Market Research)

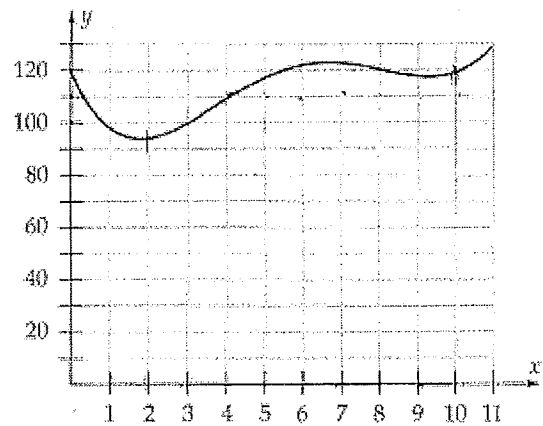
Year	2000	2001	2002	2003	2004	2005
Sales	257	129	143	214	315	485

In Exercises 2–5, find the coordinates of the point P .

3. P lies 3 units above the x -axis and on the same vertical line as $(-6, 7)$.

5. P lies 4 units to the right of the y -axis and its y -coordinate is half its x -coordinate.

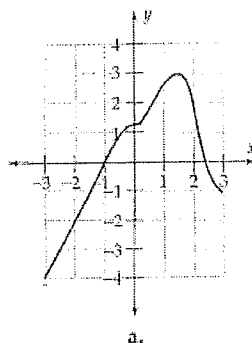
9. The graph, which is based on data from the U.S. Department of Energy, shows approximate average gasoline prices (in cents per gallon) between 1985 and 1996, with $x = 0$ corresponding to 1985.



- Estimate the average price in 1987 and in 1995.
- What was the approximate percentage increase in the average price from 1987 to 1995?
- In what year(s) was the average price at least \$1.10 per gallon?

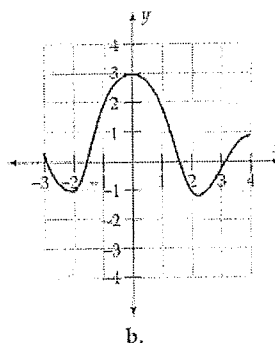
11. a. If the first coordinate of a point is greater than 3 and its second coordinate is negative, in what quadrant does it lie?
 b. What is the answer to part a if the first coordinate is less than 3?

25. State the domain and range of the function defined by graph a.



13. a. Plot the points (3, 2), (4, -1), (-2, 3), and (-5, -4).
 b. Change the sign of the y -coordinate in each of the points in part a, and plot these new points.
 c. Explain how the points (a, b) and $(a, -b)$ are related graphically.
Hint: What are their relative positions with respect to the x -axis?

29. State the output (number in the range) that the function of Exercise 28 produces from the following inputs (numbers in the domain): -2, 0, 1, 2.5, -1.5.



In Exercises 15–18, determine whether or not the given table could possibly be a table of values of a function. Give reasons for each answer.

15.

Input	-2	0	3	1	-5
Output	2	3	-2.5	2	14

17.

Input	-5	1	3	-5	7
Output	0	2	4	6	8

32. Find the indicated values of the function by hand and by using the table feature of a calculator.

$$g(x) = \sqrt{x + 4} - 2$$

- a. $g(-2)$ b. $g(0)$ c. $g(4)$
 d. $g(5)$ e. $g(12)$