Mini-Lecture 2.1

Relations

Learning Objectives:

1. Understand relations.
2. Find the domain and the range of a relation.
3. Graph a relation defined by an equation.

Preparing for Relations:

i) Write the inequality $-3 \le x < -1$ in interval notation.

$[-3, -1)$

DEFINITION

When the elements in one set are linked to elements in a second set, we have a **relation.** If x and y are two elements in these sets and if a relation exists between x and y, then we say that x **corresponds** to y or that y **depends on** x, and we write $x \to y$. We may also write a relation where y depends on x as an ordered pair (x, y).

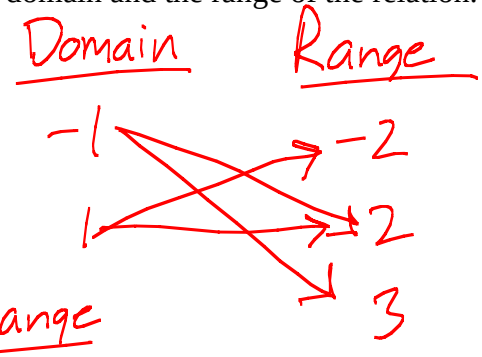
DEFINITION

The **domain** of a relation is the set of all inputs of the relation. The **range** is the set of all outputs of the relation.

Examples:

1. Write each relation as a map. Then identify the domain and the range of the relation.

   a) $\{(-1, 2), (-1, 3), (1, 2), (1, -2)\}$

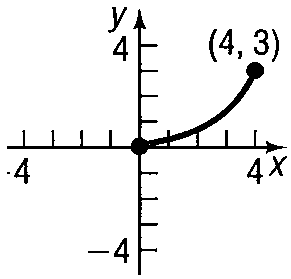


   b) $\{(0, 1), (0, 3), (0, 5)\}$

2. Identify the domain and the range from the graph. Write your answer in set builder notation and in interval notation.

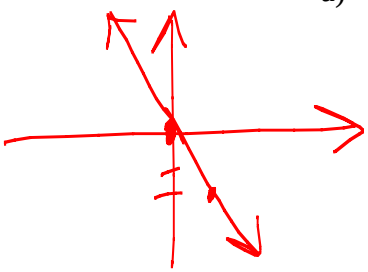
D: $\{x \mid 0 \le x \le 4\}$ $\quad x \in [0, 4]$

R: $\{y \mid 0 \le y \le 3\}$ $\quad y \in [0, 3]$



3. Use the graphs obtained in mini-lecture 1.5 to identify the domain and the range of the relation.

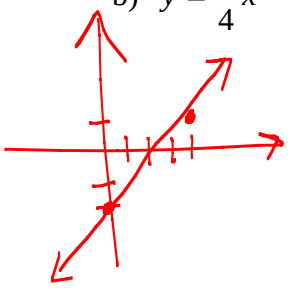
a) $y = -2x$



D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

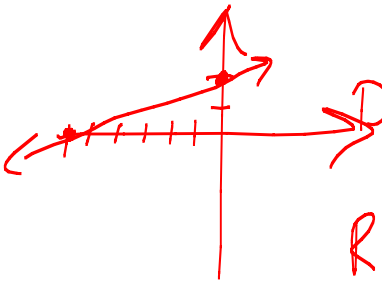
b) $y = \frac{3}{4}x - 2$



D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

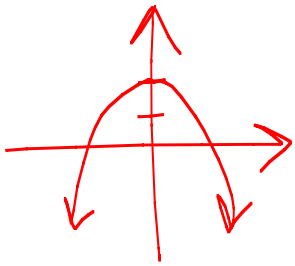
c) $x - 3y = -6$



D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

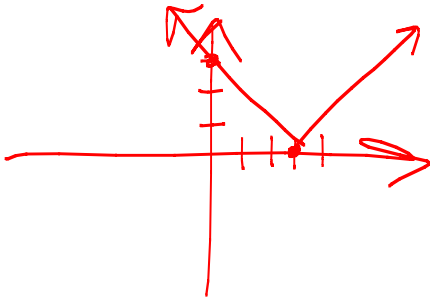
d) $y = -x^2 + 2$



D: $(-\infty, \infty)$

R: $(-\infty, 2]$

e) $y = |x - 3|$



D: $(-\infty, \infty)$

R: $[0, \infty)$