

Domain & Range

December-10-18
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PRE-CALCULUS 11 QUADRATIC FUNCTIONS DOMAIN & RANGE

A. Definitions

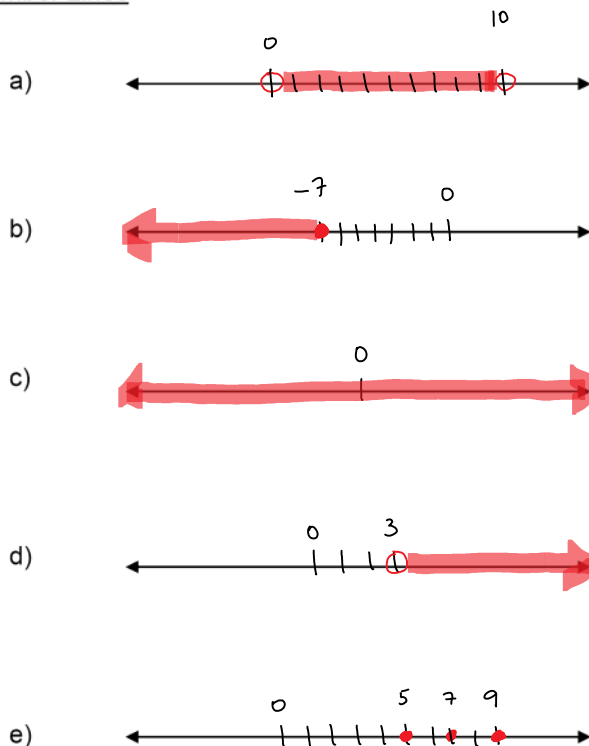
1. **domain:** the set of all possible values for the independent variable (x values) in a relation.
2. **range:** the set of all possible values for the dependent variable (y values) in a relation.
3. **All Real Numbers:** a statement used to show that all numbers are acceptable values for a domain or range. Use the symbol $x \in R$ and $y \in R$.

B. Ways of Showing Domain and Range

1. Words

- a) The domain is all numbers between 0 and 10.
- b) The range is all number less than or equal to -7
- c) The domain is all real numbers.
- d) The range is all numbers greater than 3.
- e) The domain is the numbers 5, 7, 9

2. Number Lines



3. Notation Form or Set Notation

This is the most common way that domain and range will be written.

<u>Notation Form</u>	or	<u>Set Notation</u>
a) $0 < x < 10$ <i>(red arrow under the expression)</i>		$\{x \mid 0 < x < 10, x \in R\}$
b) $y \leq -7$		$\{y \mid y \leq -7, y \in R\}$
c) $x \in R$		$\{x \mid x \in R\}$
d) $y > 3$		$\{y \mid y > 3, y \in R\}$

4. A List (A set)

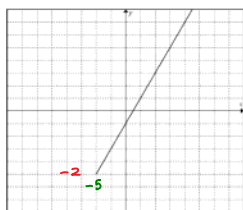
A list is the most common way to represent the domain and range for discrete data when there are only specific numbers included in the answer. The data must be written within a set of parenthesis.

- a) For a relation with discrete data $(5, 0), (5, 5), (7, 7), (9, 7)$ 5, 5, 7, 9
↓ ↓ ↓ ↓
 The domain would be written $\{5, 7, 9\}$ ← smallest to largest 0, 5, 7
 The range would be written $\{0, 5, 7\}$ ← smallest to largest.

C. Examples

- 1) State the domain and range of the following. Show your answer in notation form and set notation form, or as a set where necessary.

a)



D: $x \geq -2$ or $\{x \mid x \geq -2, x \in R\}$
 R: $y \geq -5$ or $\{y \mid y \geq -5, y \in R\}$

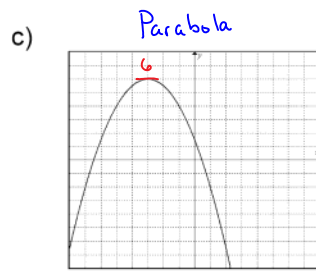
b)

Discrete Data.

x	y
-2	8
0	5
-5	11
3	1

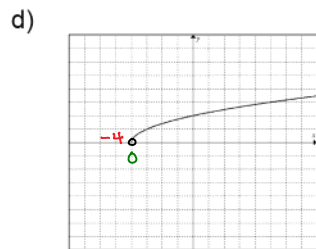
Domain: $\{-5, -2, 0, 3\}$
 Range: $\{1, 5, 8, 11\}$

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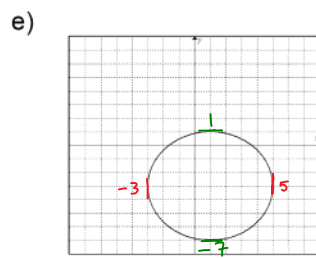
$$D: x \in \mathbb{R} \quad \text{or} \quad \{x \mid x \in \mathbb{R}\}$$

$$R: y \leq 6 \quad \text{or} \quad \{y \mid y \leq 6, y \in \mathbb{R}\}$$



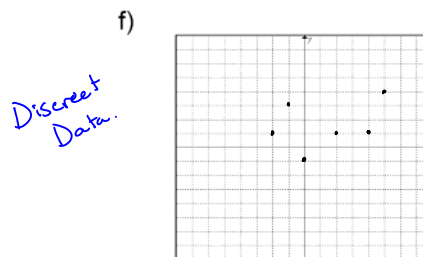
$$D: x > -4 \quad \text{or} \quad \{x \mid x > -4, x \in \mathbb{R}\}$$

$$R: y > 0 \quad \text{or} \quad \{y \mid y > 0, y \in \mathbb{R}\}$$



$$D: -3 \leq x \leq 5 \quad \text{or} \quad \{x \mid -3 \leq x \leq 5, x \in \mathbb{R}\}$$

$$R: -7 \leq y \leq 1 \quad \text{or} \quad \{y \mid -7 \leq y \leq 1, y \in \mathbb{R}\}$$



$$D: \{-2, -1, 0, 2, 4, 5\}$$

$$R: \{1, 2, 3, 4\}$$

Assignment : Domain & Range Assignment #1, 2, 4, 5, 6, 7, 8

Assignment

1. State the domain and range of each relation.

- a) $(2, 3), (0, 2), (4, 8), (-1, 8), (-3, 1)$ b) $(-3, 3), (0, -5), (-3, 3), (5, -2), (-8, 1)$

c)

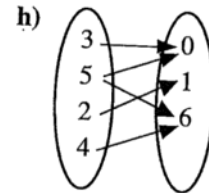
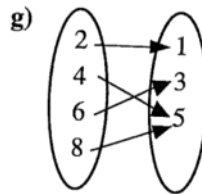
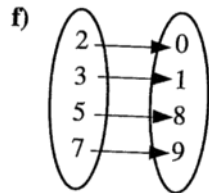
Input (x)	Output (y)
0	3
2	4
4	5
6	3

d)

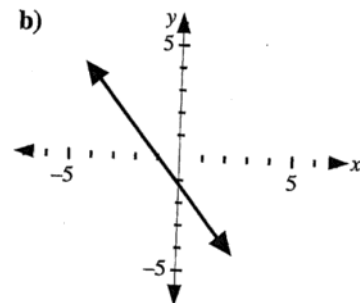
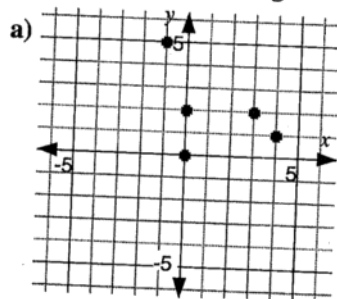
Input (x)	Output (y)
2	3
0	4
-3	5
2	6

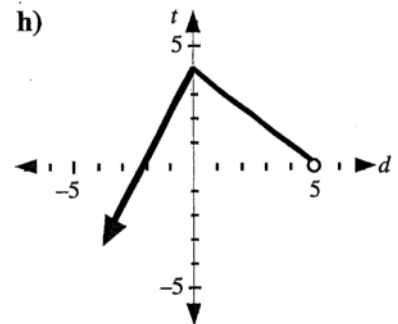
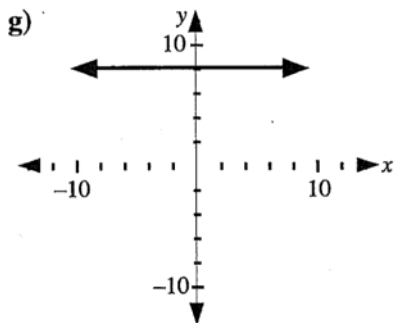
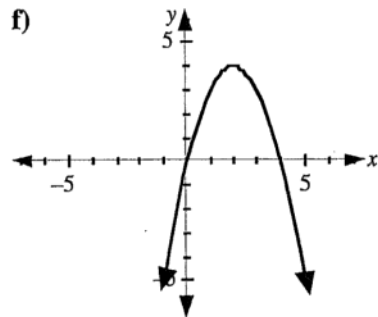
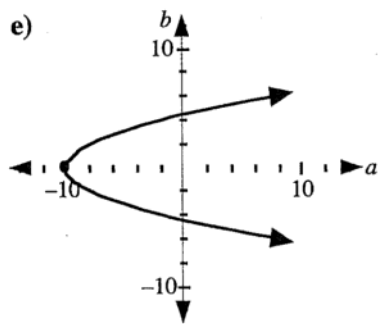
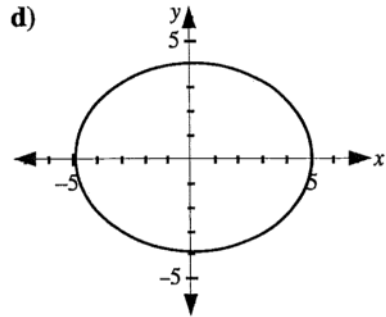
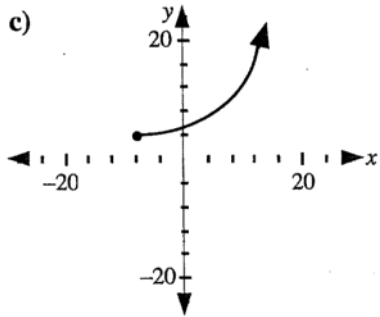
e)

Input (x)	Output (y)
1	5
-1	5
3	5
7	5

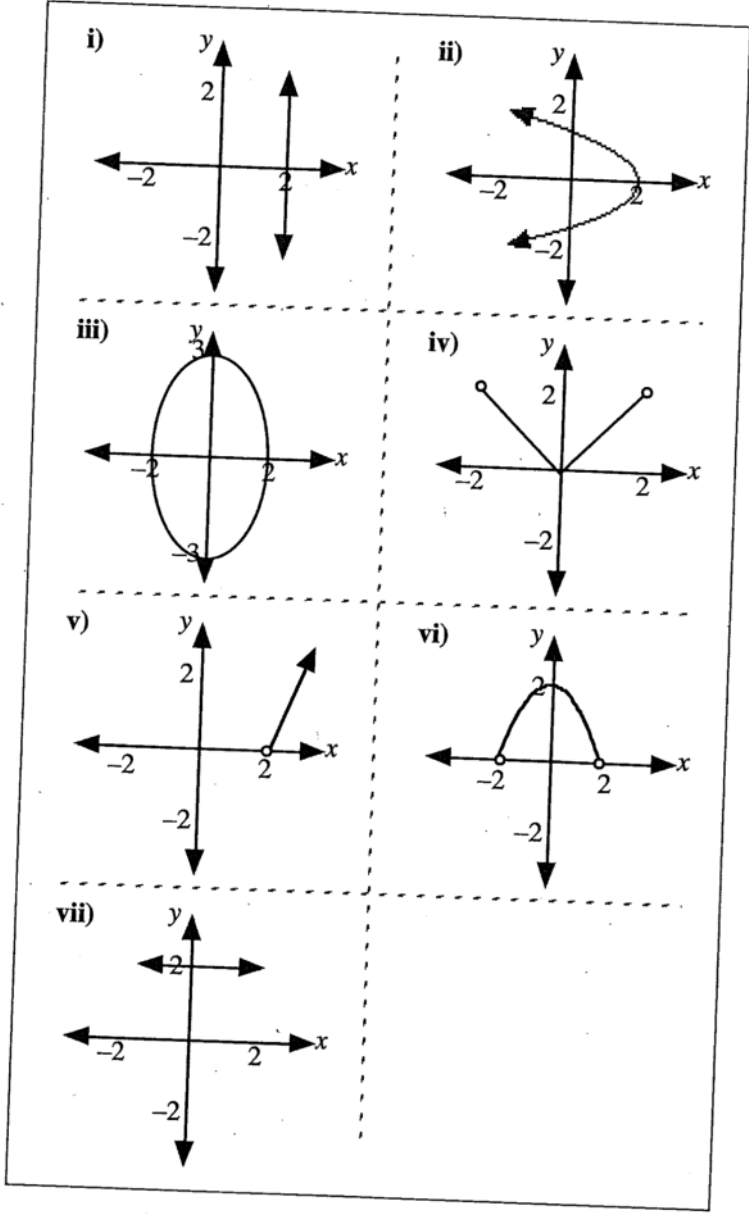


2. State the domain and range for each relation.



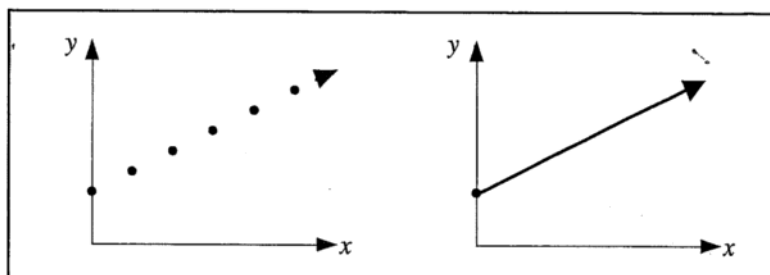


6. Match each graph with the domain from A to F. Each domain may be used once, more than once, or not at all.



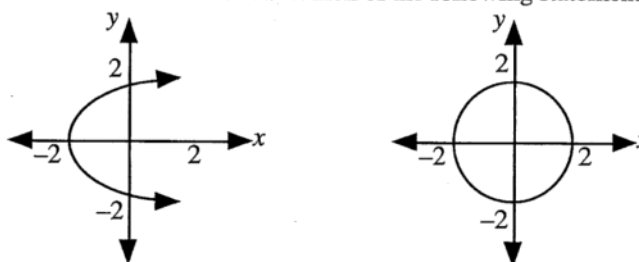
- A. $x = 2$
- B. $x < 2$
- C. $x \leq 2$
- D. $x > 2$
- E. $x \geq 2$
- F. $-2 < x < 2$
- G. $-2 \leq x \leq 2$
- H. $2 < x < -2$
- I. $x \in \mathcal{R}$

Multiple Choice 7. The graphs of two relations are shown. Which of the following statements is true?



- A. The domains are the same but the ranges are different.
- B. The ranges are the same but the domains are different.
- C. The domains are the same and the ranges are the same.
- D. The domains are different and the ranges are different.

8. The graphs of two relations are shown. Which of the following statements is true?



- A. The range of each relation is $-2 \leq y \leq 2$.
- B. The range of each relation is $y \in \mathbb{R}$.
- C. The domain of each relation is $-2 \leq x \leq 2$.
- D. None of the above.

Numerical Response 9. The relation between the distance travelled, d km, and the cost, C dollars, of renting a truck is given by the formula $C = 60 + 0.27d$. The domain of the relation can be expressed in the form $d \geq x$ and the range can be expressed in the form $C \geq y$. Write the value of y in the first two boxes and the value of x in the last two boxes.

(Record your answer in the numerical response box from left to right)

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Answer Key

1. a) $D = \{2, 0, 4, -1, -3\}$
 $R = \{3, 2, 8, 1\}$ b) $D = \{-3, 0, 5, -8\}$
 $R = \{3, -5, -2, 1\}$ c) $D = \{0, 2, 4, 6\}$
 $R = \{3, 4, 5\}$ d) $D = \{2, 0, -3\}$
 $R = \{3, 4, 5, 6\}$
- e) $D = \{1, -1, 3, 7\}$
 $R = \{5\}$ f) $D = \{2, 3, 5, 7\}$
 $R = \{0, 1, 8, 9\}$ g) $D = \{2, 4, 6, 8\}$
 $R = \{1, 3, 5\}$ h) $D = \{3, 5, 2, 4\}$
 $R = \{0, 1, 6\}$
2. a) $D = \{-1, 0, 3, 4\}$
 $R = \{5, 0, 2, 1\}$ b) $D = \{x \in \mathfrak{R}\}$
 $R = \{y \in \mathfrak{R}\}$ c) $D = \{x \geq -8, x \in \mathfrak{R}\}$
 $R = \{y \geq 4, y \in \mathfrak{R}\}$ d) $D = \{-5 \leq x \leq 5, x \in \mathfrak{R}\}$
 $R = \{-4 \leq y \leq 4, y \in \mathfrak{R}\}$
- e) $D = \{a \geq -10, a \in \mathfrak{R}\}$
 $R = \{b \in \mathfrak{R}\}$ f) $D = \{x \in \mathfrak{R}\}$
 $R = \{y \leq 4, y \in \mathfrak{R}\}$ g) $D = \{x \in \mathfrak{R}\}$
 $R = \{8\}$ h) $D = \{d < 5, d \in \mathfrak{R}\}$
 $R = \{t \leq 4, t \in \mathfrak{R}\}$
3. a) $D = \{-6 \leq x \leq 4, x \in \mathfrak{R}\}$
 $R = \{7 \leq y \leq 17, y \in \mathfrak{R}\}$ b) $D = \{-23 \leq x \leq 17, x \in \mathfrak{R}\}$
 $R = \{-25 \leq y \leq 15, y \in \mathfrak{R}\}$
- c) $D = \{-8 \leq x \leq 7, x \in \mathfrak{R}\}$
 $R = \{-2 \leq y \leq 10, y \in \mathfrak{R}\}$ d) $D = \{-65 \leq x \leq -35, x \in \mathfrak{R}\}$
 $R = \{-75 \leq y \leq -25, y \in \mathfrak{R}\}$
4. a) $D = \{x \in \mathfrak{R}\}$ $R = \{y > 0, y \in \mathfrak{R}\}$, y -ints 0 and 400
- b) $D = \{t \geq 0, t \in \mathfrak{R}\}$ different from a) because time is never a negative value.
 $R = \{a \geq 400, a \in \mathfrak{R}\}$ different from a) because the amount of money can never be less than \$400.
5. a) h -int = 0, d -int = 0 and 200. On the tee the ball is on the ground.
 It returns to ground level 200 m from the tee.
- b) max height = 25 m. The maximum height is the upper limit of the range.
- c) $D = \{0 \leq d \leq 200, d \in \mathfrak{R}\}$ $R = \{0 \leq h \leq 25, h \in \mathfrak{R}\}$
- d) 55 m from the tee when the ball is rising and 145m from the tee when the ball is descending.
- e) 24 m
- f) Starting from a height of 0 m at the tee, the golf ball increases in height to a maximum height of 25m, 100 m from the tee. Then the golf ball starts decreasing in height until it hits the ground 200 m from the tee.
6. i) A ii) C iii) G iv) F v) D vi) F vii) I
7. D 8. D 9.

6	0	0	0
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