

Relation – A Set of Ordered Pairs

$$\{(1,2), (3,2), (4,6)\}$$

$$\{(x,y) : y = 2x - 1, x > 2\}$$

$$\{x^2 + y^2 = 25\}$$

Domain – The Set of all 1st elements from the ordered pairs in a relation

Range – The Set of all 2nd elements from the ordered pairs in a relation

Absent a mathematical restriction, the Implied Domain is the set of Real Numbers – \mathfrak{R}

Function – A Relation where each Domain Element is paired with Exactly One Range Element

$\{x^2 + y^2 = 25\}$ contains (3,4) as well as (3,-4) \rightarrow Domain Element 3 is paired with two (not one) range elements 4 and -4 \therefore This Relation is NOT a Function.

$\{(\text{Mom, Dad}), (2, 7), (x, 4), (2, \text{Door}), (\text{Glass, road})\}$ This Relation is NOT a Function

The domain element 2 is **not** paired with Exactly One Range Element

$f(x) = 2x - 1$ is a function from the set of x values to the set of f values

$g(y) = 4y^2 + 5$ g is a function of y, but y is not a function of g. Why?

$$g(5) = 105$$

$$g(w+1) = 4(w+1)^2 + 5 = 4(w^2 + 2w + 1) + 5 = 4w^2 + 8w + 9$$

$h(x) = \sqrt{2x+1}$ Find the Domain and the Range of the Function h

Domain: $\{x : x \geq -\frac{1}{2}\}$

Range: $\{y : y \geq 0\}$

Difference Quotient for $f(x)$: $\frac{f(x+h) - f(x)}{h}$ Generally, this is often considered for values of h that are extremely close to zero.

Find the Difference Quotient for $f(x) = 3x^2 + 2x$

$$\frac{3(x+h)^2 + 2(x+h) - (3x^2 + 2x)}{h}$$

$$= \frac{3(x^2 + 2xh + h^2) + 2x + 2h - 3x^2 - 2x}{h}$$

$$= \frac{3x^2 + 6xh + 3h^2 + 2x + 2h - 3x^2 - 2x}{h}$$

$$= \frac{6xh + 3h^2 + 2h}{h}$$

$$= \frac{h(6x + 3h + 2)}{h}$$

$$= 6x + 3h + 2$$

What happens to this outcome as h gets extremely close to zero?

The quantity approaches $6x + 2$

Pre-Calculus 1 Assignment 102

Page 24, #'s 8, 10, 14, 18, 28, 34, 38, 40, 46, 50, 56, 62, 63, 66, 70, 72, 76, 88

Exer. 5-8: Decide whether the relation represents y as a function of x . Explain your reasoning.

8.

Input, x	0	3	9	12	15
Output, y	3	3	3	3	3

Exer. 9-10: Which sets of ordered pairs represent functions from A to B ? Explain.

10. $A = \{a, b, c\}$ and $B = \{0, 1, 2, 3\}$

- (a) $\{(a, 1), (c, 2), (c, 3), (b, 3)\}$
- (b) $\{(a, 1), (b, 2), (c, 3)\}$
- (c) $\{(1, a), (0, a), (2, c), (3, b)\}$
- (d) $\{(c, 0), (b, 0), (a, 3)\}$

Exer. 13-24: Determine whether the equation represents y as a function of x .

14. $x = y^2 + 1$

18. $x = -y + 5$

Exer. 27-42: Evaluate the function at each specified value of the independent variable and simplify.

28. $g(x) = 7 - 3x$

(a) $g(0) =$

(b) $g\left(\frac{7}{3}\right) =$

(c) $g(s + 2) =$

34. $q(t) = \frac{2t^2 + 3}{t^2}$

(a) $q(2) =$

(b) $q(0) =$

(c) $q(-x) =$

38. $f(x) = \begin{cases} 2x + 5, & x \leq 0 \\ 2 - x^2, & x > 0 \end{cases}$

(a) $f(-2) =$

(b) $f(0) =$

(c) $f(1) =$

40. $f(x) = \begin{cases} x^2 - 4, & x \leq 0 \\ 1 - 2x^2, & x > 0 \end{cases}$

(a) $f(-2) =$

(b) $f(0) =$

(c) $f(1) =$

Exer. 43-46: Complete the table.

46. $h(x) = \begin{cases} 9 - x^2, & x < 3 \\ x - 3, & x \geq 3 \end{cases}$

x	1	2	3	4	5
$h(x)$					

Exer. 47-50: Find all real values of x such that $f(x) = 0$

50. $f(x) = \frac{2x - 3}{7}$

Exer. 53-62: Find the domain of the function.

56. $s(y) = \frac{3y}{y + 5}$

62. $f(x) = \frac{\sqrt{x + 6}}{6 + x}$

Exer. 63-66: Use a graphing utility to graph the function. Find the domain and range of the function.

63. $f(x) = \sqrt{4 - x^2}$

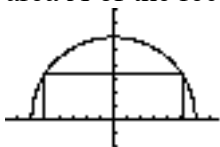
66. $g(x) = |x - 5|$

Exer. 67-70: Assume that the domain of f is the set $A = \{-2, -1, 0, 1, 2\}$. Determine the set of ordered pairs representing the function f .

70. $f(x) = |x + 1|$

72. *Geometry* Write the area A of an equilateral triangle as a function of the length s of its sides.

76. *Geometry* A rectangle is bounded by the x -axis and the semicircle $y = \sqrt{36 - x^2}$ (see figure). Write the area A of the rectangle as a function of x , and determine the domain of the function.



Exer. 87-92: Find the difference quotient and simplify your answer.

88. $g(x) = 3x - 1, \frac{g(x + h) - g(x)}{h}, h \neq 0$