

# COLLEGE ALGEBRA

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GPS #1

1.1 FUNCTIONS AND MODELS

Class Time: 11:30 Date: 1-8-07

**Useful Definitions:** Let  $X$  and  $Y$  be two nonempty sets.

- \* A **relation** is a set of ordered pairs. For example:  $\{(-1, 4), (-3, 5), (1, 2), (7, -2)\}$
- \* A **function** is a relation in which, for each value of the first component of the ordered pairs, there is exactly one value of the second component.
- \* A **function** from  $X$  into  $Y$  is a relation that associates with each element of  $X$  exactly one element of  $Y$ .
- \* In a relation, the set of all values of the independent variable is the **domain**; the set of all values of the dependent variable is the **range**.
- \* **Vertical Line Test:** If every vertical line intersects the graph of a relation only once, the relation is a function.

1. State whether each relation defines a function and give the domain and range.

a)  $\{(-1, 4), (-3, 5), (1, 2), (7, -2)\}$   $X \quad Y$

$D: \{-1, -3, 1, 7\}$   $R: \{4, 5, 2, -2\}$

is a function

-1	4
-3	5
1	2
7	-2

b)  $\{(2, 7), (3, -4), (2, 0), (1, -2)\}$

not a function

2	7
3	-4
2	0
1	-2

$D: \{2, 3, 1\}$   $R: \{7, -4, 0, -2\}$

2. Use "vertical line test" to check whether each relation defines  $y$  as a function of  $x$ . Give the domain.

a)  $y = x^2$   $D: (-\infty, \infty)$

its a function

b)  $x^2 + y^2 = 1$

not a function

X	Y
0	1
0	-1
1	0
-1	0

$D: [-1, 1]$

c)  $x = y^2$

not a function

$D: [0, \infty)$

d)  $y = x^3$

its a function

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

3. Let  $f(x) = -2x + 3$  and  $g(x) = -\frac{1}{4}x^2 + 3x + 1$ . Find the following.

a)  $f(1) = -2(1) + 3 = 1$

b)  $g(-2) = -\frac{1}{4}(-2)^2 + 3(-2) + 1 = -1 - 6 + 1 = -6$

c)  $f(m) = -2m + 3$

d)  $g(-x) = -\frac{1}{4}(-x)^2 + 3(-x) + 1 = -\frac{1}{4}x^2 - 3x + 1$

e)  $f(x+1) = -2(x+1) + 3 = -2x - 2 + 3 = -2x + 1$

e)  $g(-k) = -\frac{1}{4}(-k)^2 + 3(-k) + 1 = -\frac{1}{4}k^2 - 3k + 1$

f)  $f(x+h) - f(x) = [-2(x+h) + 3] - [-2x + 3]$

g)  $\frac{f(x+h) - f(x)}{h} = \frac{-2h}{h} = -2$

$-2x - 2h + 3 + 2x - 3 = -2h$

4. Find the domain of each of the following functions:

a)  $f(x) = x^2 + 5$   $D: (-\infty, \infty)$

b)  $g(x) = \frac{1}{4}x - 3$   $D: (-\infty, \infty)$

c)  $r(t) = \frac{2t}{t^2 - 9} = \frac{2t}{(t-3)(t+3)}$

$t^2 - 9 = 0$   
 $+3(t-3) = 0$

$D: \{t \mid t \neq \pm 3\}$

b)  $h(u) = \sqrt{10 - 2u}$   $D: (-\infty, 5]$