

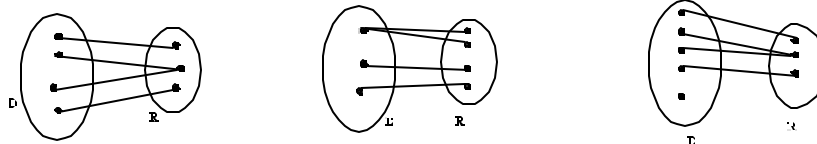
## Study Guide for Test 1

### Section 1.2:

1. Know the definition of a function and be able to determine whether a given diagram, a set of ordered pairs, an equation, or a graph defines a function.

Example:

i. Which of the following diagrams define a function?



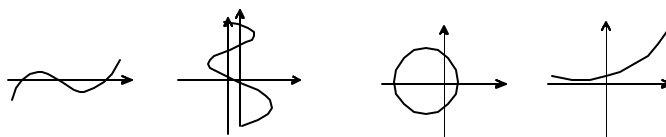
ii. Which of the following set of ordered pairs represent a function?

$$f = \{ (2, 1), (3, 1), (-2, 3), (4, -3), (5, 3) \} \quad g = \{ (2, 1), (3, 1), (2, 3), (4, -3), (5, 3) \}$$

iii. Which of the following equations represent a function?

$$2x - y = 7 \quad x^2 + y^2 = 16 \quad 2x^3 + y - 2 = 0 \quad x^3 + y^3 = 9$$

iv. Which of the following graphs represent a function?



2. If a function is given, be able to find the value of the function for any given value of  $x$  in the domain.

Example:

i. Given the functions  $f(x) = 7x^2 + 2x - 3$  and  $g(x) = \frac{2x-1}{x^2-5}$ , find

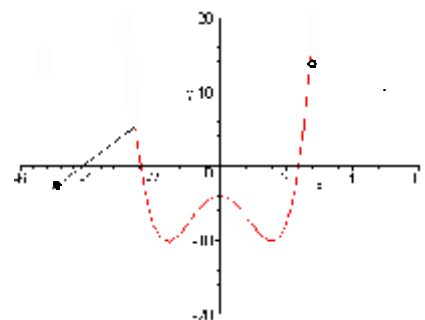
$$f(1), f(-3), f(k), f\left(\frac{k^2}{k-2}\right)$$

$$g(2), g(-7), g(n), g(n^2+2n)$$

ii. If a function  $f$  is given by the graph on the right, then

a) Find  $f(1)$ ,  $f(-3)$

b) Find the  $x$ -value(s) for which  $f(x) = 4$



### 3. Be able to find the domain of a function.

#### Example:

- i. Find the domains of functions  $f(x) = \sqrt{2x-1}$  ,  $g(x) = \sqrt{5-x}$  ,  $h(x) = \frac{x}{x-1}$  ,  $k(x) = \frac{\sqrt{x+1}}{x-4}$  both by computation and by graphing.
- ii. Find the domains and the range of the function given by the graph on the lower right corner of the previous page.

### 4. Be able to use your calculator to sketch graphs of functions. Be familiar with adjusting window, using trace, etc.

### Section 1.3:

#### 1. Be able to find the y-intercept and x-intercepts (zeros) of a function using a graphing calculator (preferably by hand as well if not too complicated).

**Examples:** see problems 13-18 on page 52 of the text book.

#### 2. Understand the notions of increasing and decreasing functions and be able to use the graph of a function to find the intervals where the function is decreasing and interval where the function is increasing.

#### 3. Understand the notions of local maximum and local minimum and be able to use the graph of a function to find size and the location of all local max. and min.

#### Example:

- i. For the function given by the graph on the lower right corner of the previous page
- Find the intervals where the function is decreasing and where it is increasing.
  - Find the size and the location of the all local extrema.
- ii. Also see problems 45-50 on page 53 of the text book

#### 4. Be able to solve problems involving maximizing or minimizing a quantity.

#### Examples:

- i. The revenue function for selling a product is given by  $R(x) = 900x - 0.1x^2$ , where  $x$  is the number of units sold. Find the number of units that produce the maximum profit. Find that maximum profit.
- ii. The cost function for producing a product is given by  $C(x) = 800 - 10x + 0.25x^2$  where  $x$  is the number of units produced. How many units must be produced to yield the minimum cost? Find that minimum cost.

iii. Also see problems 75-82 on page 54 of the text book.

**5. Be familiar with piecewise functions and be able to graph them by a graphing calculator or (preferably by hand)**

**Examples:** See problems 25-30 on page 52 of the text book

**6. Be familiar with the notions of continuity and discontinuity of a function.**

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### Section 1.4:

**1. Be familiar with some elementary functions and their graphs.**

**Examples:** See page 57 of the text book

**2. Be familiar with**

- a) Vertical Shift (Translation),      b) Horizontal Shift (Translation),      c) Reflection  
 d) Vertical and Horizontal Expansion and contraction.

**Example:** Look at EXERCISE 1.4.

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### Section 1.5:

**1. Be familiar with the algebra of functions, i.e.,**

$$(f+g)(x), (f-g)(x), (fg)(x), \left(\frac{f}{g}\right)(x)$$

and be able to find the domain of these new functions in terms of the domains of  $f$  and  $g$ .

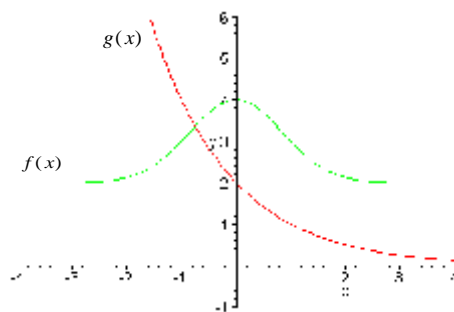
**Examples:**

i. Let  $f(x) = 3x^2 - x + 2$  and  $g(x) = 2x + 4$ . Then

a) Compute  $(f+g)(2)$ ,  $2(f-g)(5)$ ,  $\left(\frac{f}{g}\right)(-3)$ ,  $(fg)(2)$ ,  $(f+g)(2k+1)$

b) Find the domain of functions  $(f+g)(x)$ ,  $(f-g)(x)$ ,  $(fg)(x)$ ,  $\left(\frac{f}{g}\right)(x)$

ii. For the graphs given on the next page find  $(f+g)(2)$ ,  $(f \circ g)(1)$ ,  $(fg)(2)$ ,  $\left(\frac{f}{g}\right)(-3)$ .



iii. Also look at the problems assigned for this section

**2. Be familiar with notion of combination of two functions  $(f \circ g)(x)$  and  $(g \circ f)(x)$ .**

**Examples:**

i. Let  $f(x) = 3x^2 - x + 2$  and  $g(x) = 2x + 4$ . Then Compute:

$$(f \circ g)(2), 2(f \circ g)(5), (g \circ f)(-3), (f \circ g)(2k+1)$$

ii. For the functions given by the graphs on the bottom of the previous page, find  $(g \circ f)(-3)$  and  $(f \circ g)(2)$ .

iii. Also look at the assignment for this section.

**Good luck, and let us know if we can help.**