

MTH 30 LECTURE NOTES (Ojakian)

Topic 1: Introduction to Functions and Relations

OUTLINE

(References: Section 1.1)

1. Relations: Definition and Examples
 2. Functions: Definition and Examples
 3. Terminology for functions
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1. Intuitive Ideas of Functions

- (a) Given by algebraic expression (Ex: $f(x) = 2x$)
- (b) Given by a graph (graph the last one)
- (c) Given by a precise description (Ex: Make it depend on even versus odd)
- (d) Consider the typical intuitive definition via a “precise rule” ...
- (e) WHY CARE? ...

2. Relations

- (a) Binary (and n -ary)
- (b) Example represented in following ways
 - i. List pairs (Class makes it up ...)
 - ii. Table
 - iii. Graph on the plane
 - iv. Two sides with lines/arrows
- (c) More Examples
 - i. All pairs of integers (x, y) such that $y = x^3 + 1$
 - ii. $<$ on the rationals
 - iii. (x, x^2) for x real
 - iv. (x^2, x) , for x real.
 - v. The pairs (t, y) such that t ranges from the year 2000 up to the present year, and for any t , we have that y is the number of enrolled CUNY students in that year.

3. Functions

Special kind of relation:

For any number x , the x appears in the first entry in at most one pair.

- (a) Which of the above relations are functions?
- (b) Vertical Line Test
 - i. From Section 1.1 do: 43 - 46
- (c) More Examples
 - i. Consider some small finite examples, some are, some are not...

4. Basic Function Terminology

- (a) Domain = Input
- (b) Range = Output
- (c) Find some domains and ranges of above functions.
- (d) Function Notation
- (e) Independent Variable versus Dependent Variable
(and checking if one variable is “a function” of the other variable)
 - i. Section 1.1: 8, 9, 10

5. Function Evaluation

- (a) From algebraic definition
- (b) From table definition
 - i. Section 1.1 do 66, 67
- (c) From graph definition
 - i. From Section 1.1 do 52, 53

6. One to One Function

- (a) Definition ...
- (b) Table: Look at arrows
- (c) Graph: Horizontal Line Test
 - i. Example - From Textbook 1.1: 55-57

7. Application Problems

From Section 1.1 do: 88, 90