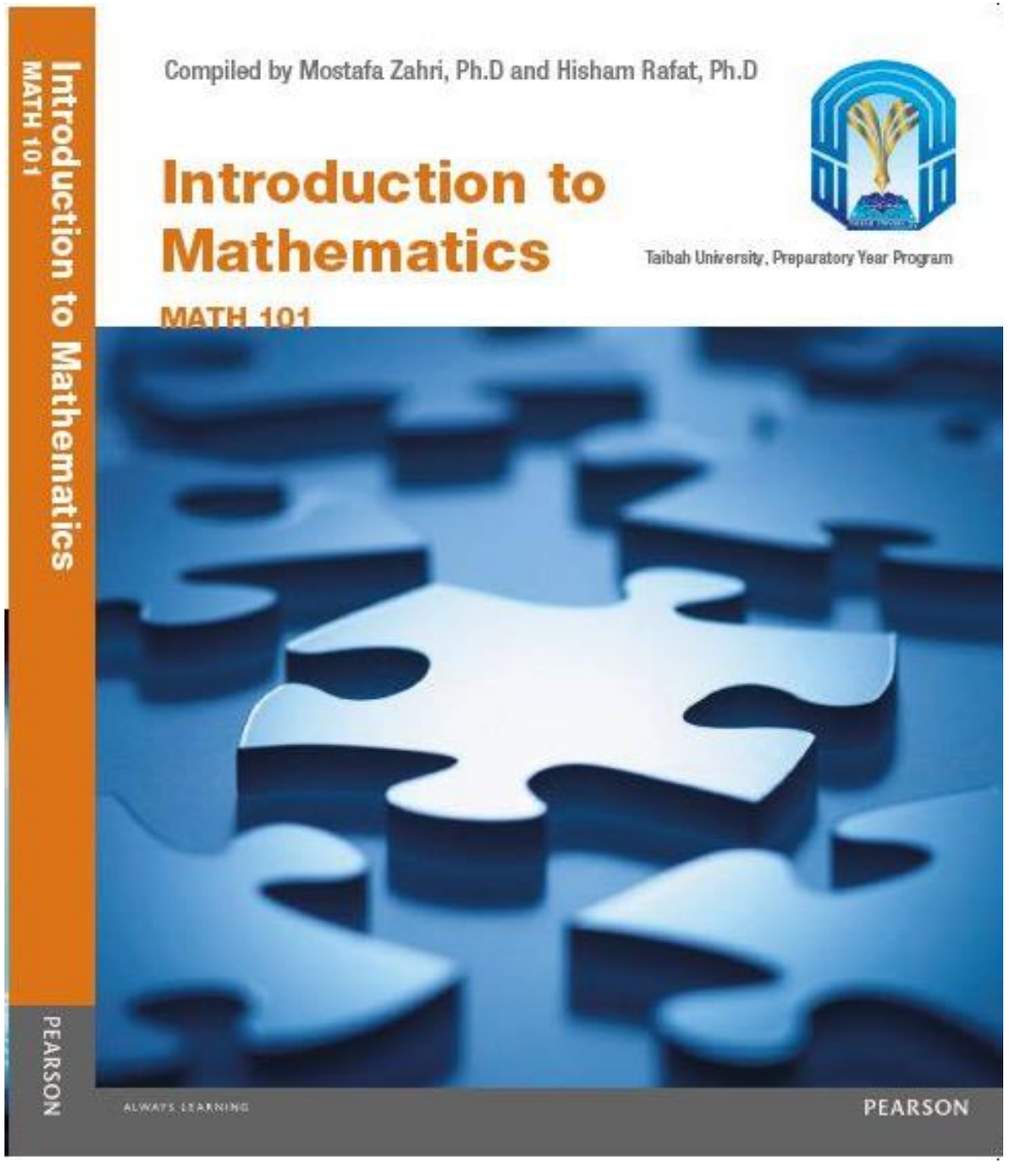
- Math-101
- Chaaper-1.1



Tests and Degrees

- First Exam (25D)
- Second Exam (Mid Term) (25D).
- Third Exam (25 D)
- and they choose the best two degrees اختياري
- Participate + Exercises + I-Clicker (10D)
- Final Exam (40 D).
- Total (100 D)

Ch. 1: Review of Basic Concepts

- 1.1: Sets
- 1.2: Real Numbers and Their Properties
- 1.3: Polynomials
- 1.4: Factoring Polynomials
- 1.5: Rational Expressions
- 1.6: Rational Exponents

1.1 Sets

- Basic Definitions
- Operations on Sets

Basic Definitions

Set: A set is a collection of objects.

The objects that belongs to a set are called the elements, or members, of the set.

*Sets are commonly written using set braces{ }.

- **Any set has name: A,B,C,S,…**
- **Elements: a,b,c,…..**
- **Ex: S={1,2,3}, A={a,b,c},…**

– **The order is not important.**

– **{1,2,3}={2,1,3}={3,1,2}**

– **Don’t repeat any element.**

– **{1,1,2,3} is False, {1,2,3} is True**

$\in$ Belongs to , $\notin$ Don't belongs to

$$4 \in \{1,2,3,4\}, a \in \{a,b,c\}$$

$$5 \notin \{1,2,3,4\}, d \notin \{a,b,c\}$$

Set builder notation

$$\textit{The set of } \textit{Natural numbers } N = \{1, 2, 3, \dots\}$$

S={1,2,3,4}=

{the set containing the first four counting number }

B={x|x is a natural number between 2 and 7}={3,4,5,6}

Finite and Infinite sets

A finite set is one that has a limited number of elements.

S={1,2,3,4}

A={1,2,3,…,20}

B= $\{x|\ x\ is\ a\ natural\ number\ between\ \ 2\ and\ 7\} = \{3,4,5,6\}$

Infinite set: is one that has no limited number of elements.

N={1,2,3,…} (Natural counting numbers) .

Finite and Infinite sets

Infinite set:

O={1,3,5,…} (Odd numbers)

E={2,4,6,…} (Even numbers)

$F = \{x | x\ is\ a\ fraction\ number\ between\ 0\ and\ 1\}$

Between any two distinct natural numbers there are infinitely many fractions. .

Sets.

Example 1: **Using Set Notation and Terminology**

Identify each set as finite or infinite. Then determine whether 10 is an element of the set.

A={7,8,9,…,14}

B={1,1/4,1/16,1/64,…}

C={x|x is a fraction between 1 and 2}

D={x|xis a natural number between 9 and 11}

1.1 Sets

Homework 1: Listing the Elements of a Set

Use set notation, and write the elements each set.

a) {x|x is a natural number less than 5}

b) {x|x is a natural number greater than 7 and less than 14}

Especial Sets

1) The empty set : (the null set)

$$\emptyset = \{\ \}$$

2) The universal set U=contains all elements included in the discussion.

Subset $\subseteq$ and not subset $\nsubseteq$

A$\subseteq B$ if all elements in A are elements in B.

1) A={2,5,9}, B={2,3,5,6,9,10}

A$\subseteq B$, B$\nsubseteq A$

2) S={1,2,3,4}, S$\subseteq N$.

3) $\emptyset \subseteq A \; for \; any \; set \; A.$

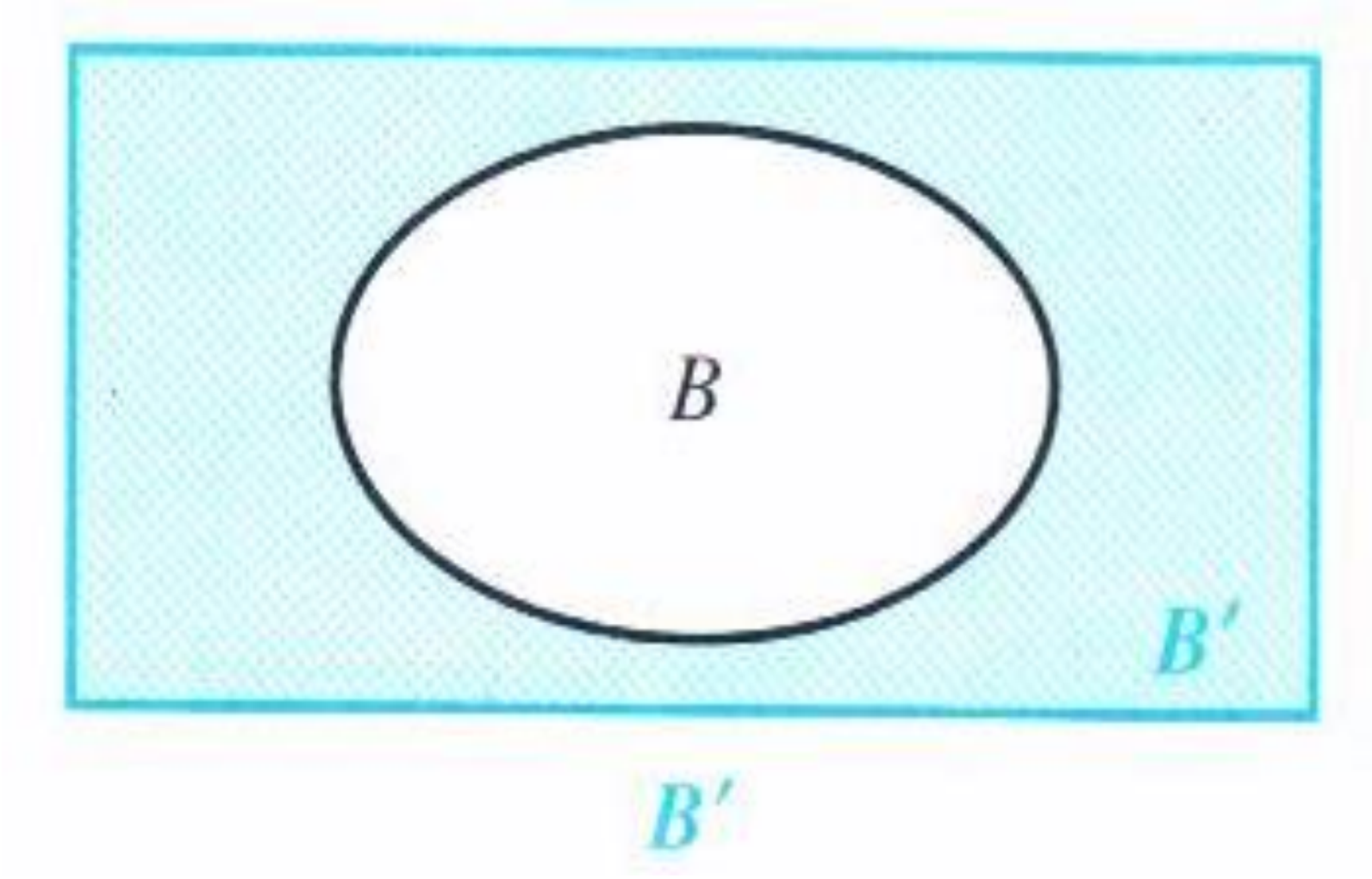
A=B iff A$\subseteq B$ and $B \subseteq A$

{1,2,3}={3,2,1}

But

{1,2,3}≠ {0,1,2,3}

THE COMPLEMENT المكملة



Operations on Sets

The complement of a set A المكملة

$$\grave{A}(A - prime) = \{x | x \in U \ and \ x \notin A\}$$

Homework 2.

Let U={1,2,3,4,5,6,7}, A={ 1,3,5,7}, B={3,4,6} ,

Find each set

$a)\grave{A}$

$b)B`$

$c)\ \emptyset`$

$d)U`$

Operations on Sets

Example 2:

Let U={1,3,5,7,9,11,13},

A={ 1,3,5,7,9,11},

B={1,3,7,9} ,

C={3,9,11}, and

D={1,9}.

Determine each statement True or False.

$a) \ D \subseteq B$

$b) \ B \subseteq D$

$c) \ C \nsubseteq A$

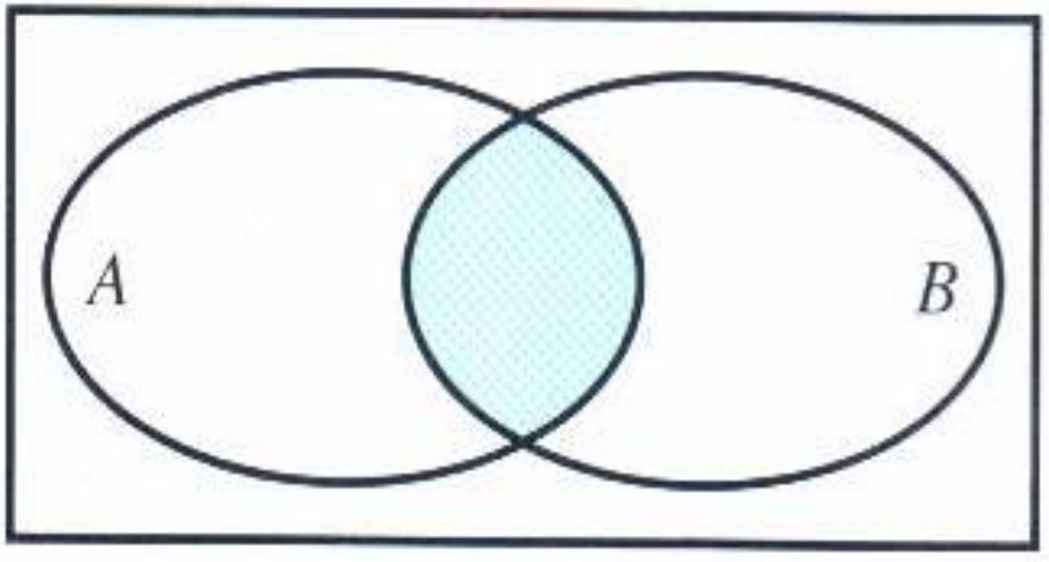
$d) \mathrm{U} = \mathrm{A}$

The intersection التقاطع

- $A \cap B = \{x | x \in A \; and \; x \in B\}$
- Ex:
- $\{1,2,4,5,7\} \cap \{2,4,5,7,9,11\} = \{2,4,5,7\}$

- $\{50,51,54\} \cap \{52,53,55,56\} = \emptyset$

The intersection



$A \cap B$

Notes: 1) If A$\subset B \Rightarrow A \cap B = A$

2) $A \cap \emptyset = \emptyset$**,** **3)** $A \cap U = A$

4) $A \cap A = A$

Set Operations

Example 3: **Finding the Intersection of Two Sets**

Find each of the following.

$a) \{9, 15, 25, 36\} \cap \{15, 20, 25, 30, 35\}$

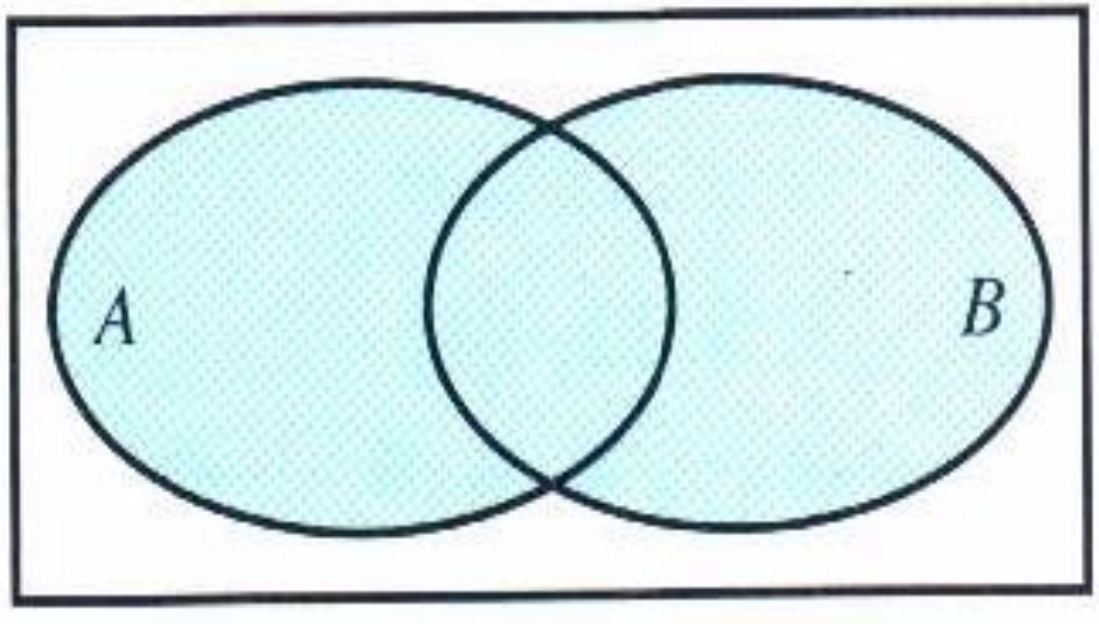
$b) \{2, 3, 4, 5, 6\} \cap \{1, 2, 3, 4\}$

$c) \{1, 3, 5\} \cap \{2, 4, 6\}$

The Union الاتحاد

- $A \cup B = \{x | x \in A \ or \ x \in B\}$
- Ex: $\{1,3,5\} \cup \{3,5,7,9\} = \{1,3,5,7,9\}$

The union



$A \cup B$

Notes: 1) If A$\subset B \Rightarrow A \cup B = B$

$2) A \cup \emptyset = A,$ $3) A \cup U = \mathrm{U}$ $4) A \cup A = \mathrm{A}$

Set Operations

Homework 3: **Finding the Union of Two Sets**

Find each of the following.

$a) \{1, 2, 5, 9, 14\} \cup \{1, 3, 4, 8\}$

$b) \{1, 3, 5, 7\} \cup \{2, 4, 6\}$

$c) \{1, 3, 5, 7, \dots\} \cup \{2, 4, 6, 8, \dots\}$

Operations

Let A and B be sets, with universal set U.

The complement of a set A is the set $\grave{A}$ of all elements in the universal set that do not belong to set A.

$$\grave{A} = \{x | x \in U, x \notin A\}$$

The intersection of a set A and B, Written $A \cap B$, is made up all the elements belongs to both set A and set B.

$$A \cap B = \{x | x \in A \text{ and } x \in B\}$$

The union of sets A and B, written $A \cup B$, is made up of all the elements belongs to set A or to set B.

$$A \cup B = \{x | x \in A \text{ or } x \in B\}$$