Department of Mathematics

Algebra I

Algebra for College Students

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Contents

Preface

In the name of Allah

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1   Fundamental Theorem of Arithmetic

P E M D A S

- **P**: Parenthesis.

- **E**: Exponents.

- **M**: Multiplication.

- **D**: Division.

- **A**: Addition.

- **S**: Subtraction.

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2   Properties of addition & multiplication

2.1   Addition:

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3   Rational Numbers

3.1   Definition

Definition 3.1: Rational Numbers

$$\{x = \frac{a}{b} \in \mathbb{Q} \mid a, b \in \mathbb{Z} \,\&\, b \neq 0\}$$

Corollary 3.2

$$\mathbb{N} \subset \mathbb{Z} \subset \mathbb{Q} \subset \mathbb{R} \subset \mathbb{C}$$

3.1.1   Types of Decimal Numbers:

Type	Rational?
Terminating	Yes
Non-terminating & Repeating	Yes
Non-terminating & Non-repeating	No

Table 1: Types of Decimal Numbers

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4   Equality

4.1   Properties

Properties of an equality:

- Reflexive:

$$a = a$$

- Symmetric:

$$a = b \Rightarrow b = a$$

- Transitive:

$$a = b \ \& \ b = c \Rightarrow a = c$$

- Substitution: if $a = b$, then either a or b can be replaced by the other without changing the meaning of the equality.

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5   Absolute Values:

5.1   Definition

Definition 5.1: Absolute Value $|x|$

$\forall x \in \mathbb{R},$

$$|x| = \left\{ \begin{array}{ll} x & ; x \geq 0 \\ -x & ; x < 0 \end{array} \right\} \tag{1}$$

5.2   Properties

Property 5.2

- $|x| = |-x|$

   Corollary 5.3

   $$|x - y| = |y - x|$$