

Introduction

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

We are pleased to introduce this book to show the philosophy on which the academic content has been prepared. This philosophy aims at:

١) Developing and integrating the knowledgeable unit in Math, combining the concepts and relating

all the school mathematical curricula to each other. ٢) Providing learners with the data, concepts, and plans to solve problems. ٣) Consolidate the national criteria and the educational levels in Egypt through:

A) Determining what the learner should learn and why. B) Determining the learning outcomes accurately. Outcomes have seriously focused on the following: learning Math remains an endless objective that the learners do their best to learn it all their lifetime. Learners should like to learn Math. Learners are to be able to work individually or in teamwork. Learners should be active, patient, assiduous and innovative. Learners should finally be able to communicate mathematically. ٤) Suggesting new methodologies for teaching through (teacher guide). ٥) Suggesting various activities that suit the content to help the learner choose the most proper activities for him/her. ٦) Considering Math and the human contributions internationally and nationally and identifying the contributions of the achievements of Arab, Muslim and foreign scientists. In the light of what previously mentioned, the following details have been considered:

* This book contains three domains: algebra, relations and functions, calculus and trigonometry.

The

book has been divided into related and integrated units. Each unit has an introduction illustrating the learning outcomes, the unit planning guide, and the related key terms. In addition, the unit is divided into lessons where each lesson shows the objective of learning it through the title You will learn. Each lesson starts with the main idea of the lesson content. It is taken into consideration to introduce the content gradually from easy to hard. The lesson includes some activities, which relate Math to other school subjects and the practical life. These activities suit the students' different abilities, consider the individual differences throughout Discover the error to correct some Common mistakes or the students, confirm the principle of working together and

integrate with the topic. Furthermore, this book contains some issues related to the surrounding environment

and how to deal with. * Each lesson contains examples starting gradually from easy to hard and containing various levels

of thoughts accompanied with some exercises titled Try to solve. Each lesson ends in Exercises that contain various problems related to the concepts and skills that the students learned through the lesson. * Each unit ends in Unit summary containing the concepts and the instructions mentioned and

General exams containing various problems related to the concepts and skills, which the student learned through the unit. * Each unit ends in an Accumulative test to measure some necessary skills to be gained to fulfill the

learning outcome of the unit. * The book ends in General exams including some concepts and skills, which the student learned throughout the term.

Last but not least. We wish we had done our best to accomplish this work for the benefits of our dear youngsters and our dearest Egypt.

Unit One

Functions of a real variable I and drawing curves.

Unit introduction

The swiss scientist Leonard Euler ($1707 - 1783$) is considered one of the most prominent of the eighteenth century in mathematics and physics. He had been credited with using the symbol $y=f(x)$ to express the function. He had considered that the function is a correlation between the elements of two sets with a relation that allows to calculate a variable value of dependent variable Y for another independent X which we choose freely. In such a way, he identified the function but not the curve. This contributed in converting the geometry into arithmetic relations. He had converted all the trigonometric ratios which ancient Egyptians, Babylonians and Arabs had excelled into trigonometric functions. Leonard Euler had inserted the constant number $e \approx 2.71828$ (Euler's number) as the base of the natural logarithm. Furthermore, he discovered the mathematical relation $e^x + 1 = 0$ relating among the most important five constants in Mathematics. He had also related among the trigonometric functions, exponential functions and the composite numbers. In this unit, you are going to learn different forms of the real functions, their behaviour and their graphical representation using the geometrical transformations and graphical programs and to use the real functions in solving life and mathematical problems in different fields.

Unit objectives

By the end of this unit, the student should be able to:

Identify the concept of the real function.	cubic function - rational function) and deduce the properties of each.	function - modulus functions
Determine the domain, co-domain and range of the real functions.	Deduce the effect of the following transformations: $f(x \pm a) \pm b$ and $a f(x \pm b) \pm c$ on the previous functions.	Relate what they learned about the effect of the previous transformations on the trigonometric functions in the form of activities.
Identify a simplified idea about the operations on the real functions (compositions of functions).	Apply the previous functions.	Investigate the graphical

Identify some properties of the real functions. Identify the one-to-one function, and differentiate between them. Identify polynomial functions. Deduce the monotony of the real functions (increasing, decreasing and constant functions). Identify polynomial functions. Graph the curves of quadratic function-modulus functions	transformation on graphing the curves of the real functions. Solve equations in the form of: $ ax + b = c$, $ ax + b = dx + c $ $ ax + b = cx + d$. Solve inequalities in the form of: $ ax + b < c$ and $ ax + b \leq c$ $ ax + b > c$ and $ ax + b \geq c$ Use the real functions to solve math and life problems in different	representation of the real functions which have been previously learned and the effect of the previous transformation using the "GeoGebra" program. Use the graphical calculator to represent some functions that are hard to be represented by the common methods, then learn the properties of these functions.
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Lessons of the unit
 Lesson (١ - ٢): The real functions.
 Lesson (٣ - ٤): Some properties of functions.
 Lesson (٥ - ٦): Monotony of function
 Lesson (٧ - ٨): Graphical representation of functions and geometrical transformations.
 Lesson (٩ - ١٠): Solving Absolute Value Equations and Inequalities.
 Materials
 Materials Scientific calculator,
 Computer (Graph. GeoGebra)

Key terms

Real Function Domain Co-domain Range Vertical Line Piecewise-Defind Function Composite Function Even Function	Odd Function One-to-One Function Monotony of a Function Increasing Function Decreasing Function Constant Function polynomial Function Absolute Value Function	Rational Function Asymptote Transformation Translation Reflection Stretching Graphical Solution
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