

MATHEMATICS

MTH-5080-1 — Exponential and Logarithmic Functions

**DEFINITION OF THE DOMAIN FOR
SUMMATIVE EVALUATION**

SEPTEMBER 1997

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Direction de la formation générale des adultes
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1. Introduction

This definition of the domain for summative evaluation describes and classifies the essential and representative elements of the *Mathematics* program—specifically, for module *Exponential and Logarithmic Functions*. It presents an overview of the program, but should by no means replace the program itself. The purpose of defining the domain is to ensure that all summative evaluation instruments are consistent with the overall program.

The organization of this definition of the domain is the same as that of those of other modules. The content of each section is, however, specific to this module.

The goal of the definition of the domain for summative evaluation is to permit the preparation of examinations that are valid from one version to another, from year to year and from one school board to another, taking into account the responsibilities shared by the ministère de l'Éducation and the school boards.

2. Program Orientations and Consequences for Summative Evaluation**Orientations**

The main purpose of the adult education secondary level *Mathematics* program is to help adults understand the mathematical concepts needed to solve problems related to everyday situations, expand their knowledge of mathematics and, ultimately, facilitate access to a future occupation. Consequently, in the program, mathematics is presented as a practical tool for solving common, real-life problems.

This module, however, is more concerned with the theoretical aspects of exponential and logarithmic functions and focuses on the mastery of operational techniques necessary to solve problems.

All the learning activities in the program emphasize the acquisition of a systematic work method.

The program places equal emphasis on mastering the use of a calculator.

Consequences

During evaluation, special attention should be paid to the analysis of exponential and logarithmic functions (e.g. solution set, increase, decrease) and to the appropriate application of the rules used to simplify certain algebraic expressions.

Evaluation should measure the adult's ability to follow the steps involved in solving a problem. It should also verify whether or not the student has mastered a work method.

The use of a calculator is permitted.

3. Content of the Program for Purposes of Summative Evaluation**Concepts**

- **Exponential functions**
 - Laws of exponents
 - Graphs
 - Inverse
 - Domain, range, increase

- **Logarithmic functions**
 - Laws of logarithmic computation
 - Graphs
 - Inverse
 - Logarithms to the base 10
 - Domain, range, increase

Skills

Each skill is defined within the context of a mathematics program. Given that the adult education *Mathematics* program corresponds to the mathematics programs in the youth sector, the skills involved are the same for students in both sectors.

- **Operating:** Performing a given operation or transformation.
Possible actions: calculating, constructing, breaking down, performing, estimating, evaluating, isolating, measuring, reconstructing, solving, drawing, transforming, verifying, and so on

- **Analyzing or Synthesizing:** Establishing a link between a problem and a given solution or solving a given problem.
Possible actions: concluding, deducing, deriving, explaining, extrapolating, inferring, justifying, proving, solving, transferring, and so on

4. Table of Dimensions

CONCEPTS	EXPONENTIAL FUNCTIONS	LOGARITHMIC FUNCTIONS
SKILLS	40%	60%
OPERATING 80%	1 Conversion of expressions containing a radical to exponential form 10%	6 Simplification of logarithmic expressions 25%
	2 Graph of an exponential function 10%	7 Graph of a logarithmic function 10%
	3 Conversion of an exponential expression to logarithmic form or vice versa 5%	
	4 Graph of the inverse function of an exponential or logarithmic function 15%	
		8 Calculation of the logarithm to the base 10 of a positive real number other than 0 5%
ANALYZING OR SYNTHESIZING 20%	5 Determination of the domain, range and increase of an exponential function 10%	9 Determination of the domain, range and increase of a logarithmic function 10%

Note: The numbers 1 to 9 identify the dimensions.

5. Observable Behaviours

Examination items should be formulated on the basis of the observable behaviours listed below. The requirements and restrictions specified in the objectives of the program must be observed.

Dimension 1

Applying the laws of exponents to convert an expression containing a radical to an exponential expression.

Dimension 2

Graphing an exponential function of the form $y = b^{x+c} + d$, clearly indicating the asymptote and the Cartesian coordinates of three points on the curve.

Dimension 3

Converting a simple logarithmic expression to exponential form and vice versa. The expression is of the form $b^x = y$ or $\log_b x = y$.

Dimension 4

Graphing the inverse function f^{-1} of a function of the form $\log_b x = y$ or $b^x = y$.

Dimension 5

Given the graph of an exponential function, finding the domain, range and increase of the function and indicating the domain and range using interval or set-builder notation. The curve must be shown to be increasing.

Dimension 6

Reducing a logarithmic expression to its simplest form.

Exponential and Logarithmic Functions

Definition of the Domain

Dimension 7

Graphing a logarithmic function of the form $y = K \log_b(ax + c) + d$, clearly indicating the asymptote and the Cartesian coordinates of three points on the curve.

Dimension 8

Using a table of logarithms or a calculator, determining the logarithm to the base 10 of a positive real number other than 0. The result should be indicated by adding the characteristic and the mantissa.

Dimension 9

Given the graph of a logarithmic function, finding the domain, range and increase of the function and indicating the domain and range using interval or set-builder notation. The curve must be shown to be increasing.

6. Explanation of Content and Weighting

Given the particular content of this module on the graphic representation of exponential and logarithmic functions and the application of the laws of exponents and logarithmic computation, emphasis has been placed on the skill of operating.

However, in order to measure the students' understanding of certain theoretical concepts related to the analysis of functions, the skills of analyzing and synthesizing have also been included.

Finally, in order to ensure that the students are able to follow a problem-solving method, emphasis has been placed on the problem-solving process.

The weighting of the skills listed below is based on the program itself and on the time normally required to master these skills.

OPERATING	80%
ANALYZING OR SYNTHESIZING	20%

In accordance with the program, the concepts have been weighted more or less equally, although logarithmic functions have been weighted more heavily because of the importance of the laws of logarithmic computation.

EXPONENTIAL FUNCTIONS	40%
LOGARITHMIC FUNCTIONS	60%

7. Description of the Examination

7.1 Type of Examination

There will be a written examination consisting of items that will be scored subjectively (free-response or extended-response items). Some items may be scored objectively.

7.2 Characteristics of the Examination

- The examination must be taken at the end of the module, in a single session lasting no more than two hours.
- The distribution of marks should be consistent with the percentages indicated in the table of dimensions.
- Students are permitted to use a calculator.

7.3 Pass Mark

To pass the module, students must obtain 60 out of 100 on the examination.

