

Summer School 2013

Mathematics, Grade 12, University, Advanced Functions

MHF4U Course Outline

COURSE DESCRIPTION

This course extends students' experience with functions. Students will investigate the properties of polynomial, rational, logarithmic, and trigonometric functions; develop techniques for combining functions; broaden their understanding of rates of change; and develop facility in applying these concepts and skills. Students will also refine their use of the mathematical processes necessary for success in senior mathematics. This course is intended both for students taking the Calculus and Vectors course as a prerequisite for a university program and for those wishing to consolidate their understanding of mathematics before proceeding to any one of a variety of university programs.

CURRICULUM EXPECTATIONS

By the end of this course, students will

Strand 1: Exponential and Logarithmic Functions

- E1. demonstrate an understanding of the relationship between exponential expressions and logarithmic expressions, evaluate logarithms, and apply the laws of logarithms to simplify numeric expressions;
- E2. identify and describe some key features of the graphs of logarithmic functions, make connections among the numeric, graphical, and algebraic representations of logarithmic functions, and solve related problems graphically;
- E3. solve exponential and simple logarithmic equations in one variable algebraically, including those in problems arising from real-world applications.

Strand 2: Trigonometric Functions

- E4. demonstrate an understanding of the meaning and application of radian measure;
- E5. make connections between trigonometric ratios and the graphical and algebraic representations of the corresponding trigonometric functions and between trigonometric functions and their reciprocals, and use these connections to solve problems;
- E6. solve problems involving trigonometric equations and prove trigonometric identities.

Strand 3: Polynomial and Rational Functions

- E7. identify and describe some key features of polynomial functions, and make connections between the numeric, graphical, and algebraic representations of polynomial functions;
- E8. identify and describe some key features of the graphs of rational functions, and represent rational functions graphically;
- E9. solve problems involving polynomial and simple rational equations graphically and algebraically;
- E10. demonstrate an understanding of solving polynomial and simple rational inequalities.

Strand 4: Characteristics of Functions

- E11. demonstrate an understanding of average and instantaneous rate of change, and determine, numerically and graphically, and interpret the average rate of change of a function over a given interval and the instantaneous rate of change of a function at a given point;
- E12. determine functions that result from the addition, subtraction, multiplication, and division of two functions and from the composition of two functions, describe some properties of the resulting functions, and solve related problems;
- E13. compare the characteristics of functions, and solve problems by modelling and reasoning with functions, including problems with solutions that are not accessible by standard algebraic techniques.

DETERMINING THE FINAL MARK

In secondary university courses, the final mark is determined using the following procedure: term work comprises 70% of the final mark and end of semester summative evaluations comprise 30% of the final mark. Throughout the course, students will be assessed on curriculum expectations, receive feedback on learning, and be given opportunities to improve performance. Towards the end of the course, students will complete two summative evaluations: a Summative Evaluation (usually a performance task) and a Final Exam that will comprise the 30% of the final mark. The performance task will be administered in class. The examination will be 2 hours in duration. Students will prepare for the examination with teacher guidance and support.

The marks will be combined to form a level for each expectation.

Level 4	Sophisticated and thorough achievement of expectations
Level 3	Achieved the expectations
Level 2	Approaching the expectations
Level 1	Limited understanding of concepts
R	Remedial work required
Zero	No evidence of learning

Level	4*	4++	4+	4	4-	3+	3	3-	2+	2	2-	1+	1	1-	R+	R	R-	Zero
%	100	99	95	88	84	78	75	72	68	65	62	58	55	50	40	30	20	0

PROCESS EXPECTATIONS

- problem solving
 - helps students develop mathematical understanding;
 - allows students to reason, communicate ideas, make connections, and apply knowledge and skills;
 - increases opportunities for the use of critical-thinking skills.
- reasoning and proving
 - helps students develop an organized, analytical, well-reasoned approach to learning mathematical concepts and processes and to solving problems.
- reflecting
 - helps students consciously reflect on and monitor their own thought processes to determine whether or not they need to switch to a different strategy or rethink the problems.
- selecting tools and computational strategies
 - students need to develop the ability to select the appropriate learning tools and computational strategies to perform particular mathematical tasks, to investigate mathematical ideas, and to solve problems.
- connecting
 - helps students see how concepts and skills from one strand of mathematics are related to those from another or how a mathematical concept can be applied in the real world.
 - representing
 - students learn how to represent mathematical ideas using concrete, numeric, graphical, and algebraic representations;
 - students should be able to recognize the connections between representations, translate one representation into another, and use the different representations appropriately as needed to solve problems.
- communicating
 - students learn how to express mathematical ideas and understandings orally, visually, and in writing, using numbers, symbols, pictures, graphs, diagrams, and words.