

MHF4U – Advanced Functions

GENERAL INFORMATION

Name of School: Rosedale Academy

Department: Mathematics

Course Developer: Asim Sayed

Development Date: June 2014

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Course Title: Advanced Functions

Grade: 12

Course Type: University Preparation

Course Code: MHF4U

Credit Value: 1

Curriculum Policy Document: The Ontario Curriculum Grades 11 and 12 Mathematics, Ministry of Education 2007 (Revised)

Prerequisite: Functions, Grade 11, University Preparation, or Mathematics for College Technology, Grade 12, College Preparation

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.

PART OVERALL EXPECTATION / LEARNING OBJECTIVES

Exponential and Logarithmic Functions

EL1. Demonstrate an understanding of the relationship between exponential expressions and logarithmic expressions, evaluate logarithms, and apply the laws of logarithms to simplify numeric expressions;

EL2. 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;

EL3. Solve exponential and simple logarithmic equations in one variable algebraically, including those in problems arising from real-world applications.

Trigonometric Functions

TF1. Demonstrate an understanding of the meaning and application of radian measure;

TF2. 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;

TF3. Solve problems involving trigonometric equations and prove trigonometric identities.

Polynomial and Rational Functions

PR1. Identify and describe some key features of polynomial functions, and make connections between the numeric, graphical, and algebraic representations of polynomial functions;

PR2. Identify and describe some key features of the graphs of rational functions, and represent rational functions graphically;

PR3. Solve problems involving polynomial and simple rational equations graphically and algebraically;

PR4. Demonstrate an understanding of solving polynomial and simple rational inequalities.

Characteristics of Functions

CF1. 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;

CF2. 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;

CF3. Compare the characteristics of functions, and solve problems by modeling and reasoning with functions, including problems with solutions that are not accessible by standard algebraic techniques.

OUTLINE OF COURSE CONTENT

	Name of Unit	Time Allocated in Hours
Unit 1	Polynomial and Rational Functions	40 Hours
Unit 2	Trigonometric Functions	30 Hours
Midterm report cards		
Unit 3	Exponential and Logarithmic Functions	20 Hours
Unit 4	Characteristics of Functions	20 Hours
Unit 5	Final Examination	
	TOTAL	110 Hours

TEACHING / LEARNING STRATEGIES

The strategies used are varied to meet the needs and the range of learning styles encountered and they include the following:

Articulate Learning Module	Brainstorming
Computer Assisted Learning	Decision Making
Direct Instruction	Demonstration
Animated Games	Discussion
Group Discussion	Estimating
iSpring Presentation / Animation	Independent Study
Online Graphing Software	Memorization
Problem-Based Learning	Model Analysis
Work and Task Sheet	Note Taking
Interactive Online Activity	Oral Explanation
	Peer Assessment
	Problem Solving
	Reasoning and Proving
	Self-Assessment

STRATEGIES FOR ASSESSMENT AND EVALUATION OF STUDENT PERFORMANCE

Evaluation in this course will be continuous throughout the year and will include a variety of evaluation methods. Assessment is embedded in the lessons throughout a unit under Check-Up Time.

Assessment as Learning	Assessment for Learning	Assessment of Learning
Student Product <ul style="list-style-type: none"> <input type="checkbox"/> Journals/Letters/Emails (checklist) <input type="checkbox"/> Learning Logs (anecdotal) <input type="checkbox"/> Peer Assessments <input type="checkbox"/> Practice Worksheets 	Student Product <ul style="list-style-type: none"> <input type="checkbox"/> Check-up Time Assessments <input type="checkbox"/> Journals/Letters/Emails (checklist) <input type="checkbox"/> Pre-Skills Checks (scale) <input type="checkbox"/> Quizzes (scale) <input type="checkbox"/> Graphic organizers (scale) <input type="checkbox"/> Peer feedback (anecdotal) <input type="checkbox"/> Reports <input type="checkbox"/> Practice Worksheets 	Student Product <ul style="list-style-type: none"> <input type="checkbox"/> Assignments <input type="checkbox"/> Journals/Letters/Emails (checklist) <input type="checkbox"/> Unit Tests (scale) <input type="checkbox"/> Final Exam <input type="checkbox"/> Case Studies <input type="checkbox"/> Presentations <input type="checkbox"/> Graphic organizers (scale)
Observation <ul style="list-style-type: none"> <input type="checkbox"/> Whole class discussions (anecdotal) <input type="checkbox"/> Self-proofreading (checklist) 	Observation <ul style="list-style-type: none"> <input type="checkbox"/> Class discussions (anecdotal) <input type="checkbox"/> Problem Solving 	Observation <ul style="list-style-type: none"> <input type="checkbox"/> Presentations (rubric)
Conversation <ul style="list-style-type: none"> <input type="checkbox"/> Student teacher conferences <input type="checkbox"/> Small Group Discussions (checklist) <input type="checkbox"/> Pair work (checklist) <input type="checkbox"/> Skype meetings 	Conversation <ul style="list-style-type: none"> <input type="checkbox"/> Student teacher conferences <input type="checkbox"/> Small group discussions (checklist) <input type="checkbox"/> Pair work (anecdotal) <input type="checkbox"/> Peer-feedback (anecdotal) <input type="checkbox"/> Peer-editing (anecdotal) 	Conversation <ul style="list-style-type: none"> <input type="checkbox"/> Question and Answer Session (checklist) <input type="checkbox"/> Oral tests (scale) <input type="checkbox"/> Oral Presentation with question and answer session

FINAL GRADE

The percentage grade represents the quality of the students' overall achievement of the expectations for the course and reflects the corresponding achievement as described in the achievement chart for mathematics.

1. Term work will be 70% of the overall grade for the course;
2. The summative evaluations will be 30% of the overall grade, incorporating a final written examination.

Achievement Categories

Application:	25%	Knowledge and Understanding:	25%
Communication:	25%	Thinking/Inquiry:	25%

Achievement Chart

A Summary Description of Achievement in Each Percentage Grade Range and Corresponding Level of Achievement

Percentage Grade Range	Achievement Level	Summary Description
80–100%	Level 4	A very high to outstanding level of achievement. Achievement is above the provincial standard.
70–79%	Level 3	A high level of achievement. Achievement is at the provincial standard.
60–69%	Level 2	Moderate level of achievement. Achievement is below, but approaching the provincial standard.
50–59%	Level 1	A passable level of achievement. Achievement is below the provincial standard
Below 50%	Level R	Insufficient achievement of curriculum expectations. A credit will not be granted

RESOURCES REQUIRED BY THE STUDENT

MHF4U Online Course of Study

Graphing calculator is highly recommended

PROGRAM PLANNING CONSIDERATION

Role of Technology in the Curriculum

Rosedale Academy courses leverage the power of information and communication technologies to provide rich, dynamic learning experiences. Students explore, evaluate and create concepts and works using a wide array of digital tools. They demonstrate their learning through text, video, voice and visual assignments that teach multi-literacy and media skills. Students also enhance their computer and technology skills in ways that are useful for their future academic and personal pursuits.

Teachers at Rosedale Academy get to know their learners, provide rich, descriptive feedback and assess student contributions and products AS, FOR and OF learning through digital technologies. They enable rapid feedback and communication at any time without borders in our global community.

Tool	Use	Benefit
Discussion forums	Whole class discussion (written)	Creates a record of each student's contributions
Group activities	Small group collaboration and discussion (written)	Encourages student participation; creates a record
Live Skype sessions	Teacher leads the lesson with students as a class	Observations of whole class and individual students
Workshop	Students submit work for peer assessment to Moodle.	Peers assess each other's work based on rubrics, etc. Promotes assessment as learning
Peer Teaching	Students research a given topic and share their findings and opinions with other students.	Fosters discussion between students and allows for content to be learned and expressed from a student perspective
Journals	Small group discussions using problem solving	Improves students' critical inquiry, and reflective thinking skills about the concepts learned within the course
Learning Modules	Students explore content in an interactive manner with built-in assessments as they progress.	Students can navigate content at their own pace and assess their own learning along the way.
Computer Simulations	Individual or class exploration and visualization of concepts relating to the curriculum.	Allows hands-on exploration and investigation as an alternative learning strategy.

English as a Second Language

Rosedale Academy provides students with comprehensive ESL support to enhance their proficiency with the English language.

- All Rosedale Academy instructional materials and resources are designed with English Language Learners in mind. Online and face-to-face instructional resources make use of differentiated learning methods and carefully structured language. These resources support English language development as students are taking credit courses in all academic fields.
- Teachers at Rosedale Academy provide a variety of accommodations for English Language Learners. These accommodations include: extended time for tests and exams; chunking of assignments and tests; a safe space for asking questions; formative feedback; mini-lessons in spelling, sentence structure and grammar; and access to ESL resources and expert discussion.
- The self-paced delivery method of this course allows students to take the time that they require to engage in meaningful participation while still enjoying the enriching experience of working in an online global classroom.
- All teachers at Rosedale Academy are responsible for helping students to develop their ability to use English in academic courses.

Career Education

This course promotes skills effective for a variety of careers and informs students of some of the career opportunities where oral and written communication is considerable assets. Students will learn how to use English to inform audiences about ideas, persuade audiences to change their opinion or buy a product, and to formulate ideas. Students will also understand the importance of social media in their search for future education and career opportunities. Finally, this course also helps to prepare students for university application by providing a unit that helps them write a persuasive application essay. Beyond the immediate needs of the student, this also course focuses on demonstrating the value of English in jobs like business where clear communication is highly valued.

Academic Integrity

Students are expected to maintain high standards of honesty and academic integrity throughout their participation in all courses. This includes avoiding any instance of fraud, plagiarism and cheating. Rosedale Academy takes the following steps to ensure academic integrity:

- Students provide photo identification
- Course assignments include audio and video components
- Teachers Skype weekly with their classes
- Students are encouraged and supported to develop original work
- Exams are proctored by adults in trusted positions

When a teacher has reasonable grounds to believe that a student has violated these standards, the school principal will review the incident and, if needed, enforce disciplinary procedures. More information about *Academic Honesty* may be found in section 5.3 of the school calendar.

Late and Missed Assignment

Independent students have up to 12 months to complete a course. There are no set deadlines for course assignments. Students can proceed through each course at their own pace, but all course requirements must be completed prior to writing their final exam.

Cohort students follow a schedule in each course. This schedule specifies the due dates for all assignments. Students may request an extension if they are unable to meet a specific due date. Rosedale Academy reserves the right to deny any request. Late or missed assignments are not accepted without a valid reason.