

Course Outline – Advanced Functions Grade 12 (MHF 4U)

Kingston Collegiate and Vocational Institute

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Department: Mathematics

Department Head: B. Farahani

Credit Value: 1.0

Prerequisite(s): MCR 3U or MCT 4M

Policy Documents

The Ontario Curriculum: Grades 11 and 12: Mathematics (2007)

Ontario Schools Kindergarten to Grade 12 – Policy and Program Requirements (2011)

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.

Overall Curriculum Expectations and Summative Tasks

Strand: Exponential and Logarithmic Functions

By the end of this course, students will:

- 1 demonstrate an understanding of the relationship between exponential expressions and logarithmic expressions, evaluate logarithms, and apply the laws of logarithms to simplify numeric expressions
- 2 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
- 3 solve exponential and simple logarithmic equations in one variable algebraically, including those in problems arising from real-world applications

Strand: Trigonometric Functions

By the end of this course, students will:

- 4 demonstrate an understanding of the meaning and application of radian measure
- 5 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
- 6 solve problems involving trigonometric equations and prove trigonometric identities

Strand: Polynomials and Rational Functions

By the end of this course, students will:

- 7 identify and describe some key features of polynomial functions, and make connections between the numeric, graphical, and algebraic representations of polynomial functions
- 8 identify and describe some key features of the graphs of rational functions, and represent rational functions graphically
- 9 solve problems involving polynomial and simple rational equations graphically and algebraically
- 10 demonstrate an understanding of solving polynomial and simple rational inequalities

Strand: Characteristics of Functions

By the end of this course, students will:

- 11 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
- 12 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
- 13 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

70% Term Summative Assessment Tasks

Overall Expectations Evaluated	Description of Summative Assessment Task	Due Date	Level Achieved
7,9,10,11,13	Polynomial Models Test		
8,9,10,11,13	Rational Models Test		
7,8,9,10,11,13	Polynomial & Rational Models Investigation		
1,2,3,11,13	Exponential Models Test		
4,5,11,13	Trigonometric Functions Test		
4,5,6,13	Trigonometric Models Test		
12,13	Combining Functions Assignment		

Note: the tasks listed above may change over the course of the semester to allow for teachers to respond to evidence of student learning. Students will be notified in advance of any changes to the summative assessment tasks. All summative tasks must be submitted before a credit is granted.

30% Final Summative (or culminating) Activities

Overall Expectations Evaluated	Description of Final Summative Assessment Task	Level Achieved
1 - 13	Final Exam – 20%	
11, 13	Investigation – 10%	

Note: the tasks listed above may change over the course of the semester to allow for teachers to respond to evidence of student learning. Students will be notified in advance of any changes to the final summative tasks. All final summative tasks must be completed before a credit is granted.

Core Texts: **Advanced Functions, Nelson**

Additional Resources: **Course Handouts**

Assessment and Evaluation Overview

1. Learning Skills and Work Habits Achievement:

Learning skills and work habits are instructed, assessed and evaluated separately from your academic work. You will be assessed frequently on your level of achievement of the following six learning skills and work habits (e.g. through conferences with your teacher; observation during class activities; and completion of assignments where specific learning skills are addressed). Learning skills and work habits will be evaluated at mid-term and again at the end of the semester with a letter grade (E=excellent, G=good, S=satisfactory, N=needs improvement).

- **Responsibility** (e.g. fulfils responsibilities and commitments within the learning environment, completes and submits class work, homework, and assignments according to agreed-upon timelines; takes responsibility for managing own behaviour)
- **Organization** (e.g. devises and follows a plan for completing work and tasks; establishes priorities and manages time to complete tasks and achieve goals; identifies, gathers, evaluates and uses information, technology and resources to complete tasks)
- **Independent Work** (e.g. independently monitors, assesses, and revises plans to complete tasks and meet goals; uses class time appropriately to complete tasks; follows instructions with minimal supervision)
- **Collaboration** (e.g. accepts various roles and an equitable share of work in a group; responds positively to the ideas, values, opinions and traditions of other; builds healthy peer-to-peer relationships through personal and media-assisted interactions; works with others to resolve conflicts and build consensus to achieve group goals; shares information, resources, and expertise, and promotes critical thinking to solve problems and make decisions)
- **Initiative** (e.g. looks for and acts on new ideas and opportunities for learning; demonstrates the capacity for innovation and a willingness to take risks; demonstrates curiosity and interest in learning; approaches new tasks with a positive attitude; recognizes and advocates appropriately for the rights of self and others)
- **Self-regulation** (e.g. sets own individual goals and monitors progress towards achieving them; seeks clarification or assistance when needed; assesses and thinks critically on own strengths, needs and interests; identifies learning opportunities, choices, and strategies to meet personal needs and achieve goals; perseveres and makes an effort when responding to challenges)

2. Achievement of Overall Course Expectations:

Diagnostic and Formative Assessment Tasks will be used throughout the course and may include quizzes, assignments, activities and investigations. Feedback will be used to help students and teachers to determine next steps to achieve the provincial standard on the overall expectations. These assessment tasks will not be used in the determination of grades.

Summative Assessment Tasks will usually be administered at or near the end of a period of learning and may include performance tasks, portfolios of student work, and projects, and unit tests. Summative assessment tasks will be used to evaluate student learning in relation to the overall expectations of the course. Evaluation of the summative assessment tasks will be used to determine the term grade and will be worth seventy percent (70%) of the final grade for the course. The mid-term grade will be derived from evaluation of the summative assessment tasks completed up until that point. As students progress through the course, their grades will represent the students' most consistent levels of achievement of overall expectations. Where overall expectations are evaluated more than once during the term, evidence of growth will be considered in determining the final grade.

Final Summative Tasks will be administered at or near the end of the course. Thirty percent (30%) of the final grade will be based on the evaluation of final summative tasks in the form of an examination and/or other culminating activities. The tasks will be based on overall expectations from all strands and across the categories of knowledge and understanding, thinking, application and communication.

Late or Missing Assignments

Students are expected to submit assignments by the agreed-upon due dates. It is important that all summative assessment tasks be completed so that there is sufficient evidence of achievement of the overall expectations for a credit to be granted. For this reason, missed due dates will result in action on behalf of the school to collect the missing evidence at the earliest opportunity, in accordance with LDSB procedures included in the student agenda. All final summative tasks must be completed before a credit is granted.

Academic Honesty

Academic honesty is a fundamental cornerstone in student learning. A breach of academic honesty is the theft of intellectual property and is treated with the utmost seriousness. All breaches of academic honesty will be reported to the school administration and a plan of action will be implemented in accordance with LDSB procedures included in the student agenda.

Attendance and Punctuality

Regular attendance and punctuality are expected, as they contribute to success at school and are important requirements in the workplace. It is essential that you contact your teacher when you know you will be absent. Following an absence, it is critical that you work diligently to catch up on missed work. Attendance and punctuality are reported on the provincial report card. Please refer to the student agenda for further details.

Teaching and Learning Strategies:

Students in a mathematics class typically demonstrate diversity in the ways they learn best. It is important, therefore, that students have opportunities to learn in a variety of ways – individually, cooperatively, independently, with teacher direction, through hands-on experience, through examples followed by practice. In mathematics, students are required to learn concepts, procedures, and processes and to acquire skills, and they become competent in these various areas with the aid of the instructional and learning strategies best suited to the particular type of learning. The approaches and strategies used in the classroom to help students meet the expectations of this curriculum will vary according to the object of the learning and the needs of the students. Even at the secondary level, manipulatives are necessary tools for supporting the effective learning of mathematics. These concrete learning tools invite students to explore and represent abstract mathematical ideas in varied, concrete, tactile, and visually rich ways. Manipulatives are also a valuable aid to teachers. By analysing students' concrete representations of mathematical concepts and listening carefully to their reasoning, teachers can gain useful insights into students' thinking and provide supports to help enhance their thinking.

Education for Exceptional Students:

All students require support from teachers, classmates, family, and friends in order to thrive and to gain full benefit from their school experience. Some students have special needs that require supports beyond those ordinarily received in the school setting. These needs may be met through accommodations. Accommodations to meet the needs of exceptional students are set out in their Individual Education Plans. There are three types of accommodations. Instructional accommodations are changes in teaching strategies, including styles of presentation, methods of organization, or use of technology and multimedia. Environmental accommodations are changes that the student may require in the classroom and/or school environment, such as preferential seating or special lighting. Assessment accommodations are changes in assessment procedures that enable the student to demonstrate his or her learning, such as allowing additional time to complete tests or assignment, or permitting oral responses to test questions.