MHF4U Advanced Functions, Grade 12 (University Preparation)

MHF4U Course Outline revised: Spring, 2016
Mathematics Department Head: Ms. C. Sinatra

Value: 1.0 Credits   **Prerequisite:** MCR3U   **Text:** Advanced Functions 12 (McGraw-Hill Ryerson)

Course Description:

"This course extends students' experiences 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."
(Ontario Curriculum, Mathematics, 2007)

Overall Expectations: By the end of the course, students will:

A1. Demonstrate an understanding of the relationships between exponential expressions and logarithmic expressions, evaluate logarithms, and apply the laws of logarithms to simplify numeric expressions.
A2. 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.
A3. Solve exponential and simple logarithmic equations in one variable algebraically, including those in problems arising from real-world applications.

B1. Demonstrate an understanding of the meaning and application of radian measure.
B2. 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.
B3. Solve problems involving trigonometric equations and prove trigonometric identities.

C1. Identify and describe some key features of polynomial functions, and make connections between the numeric, graphical, and algebraic representations of polynomial functions.
C2. Identify and describe some key features of the graphs of rational functions, and represent rational functions graphically.
C3. Solve problems involving polynomial and simple rational equations graphically and algebraically.
C4. Demonstrate an understanding of solving polynomial and simple rational inequalities.

D1. 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.
D2. 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.
D3. 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.

Course Content:

UNIT	TOPIC
1	**Polynomial Functions** Identify characteristics of polynomial functions; make connections between polynomial functions and their graphs; solve problems involving polynomial equations and inequalities.
2	**Rational Functions** Simplify rational functions by factoring; identify restrictions; represent functions graphically and algebraically; solve rational equations and inequalities.
3	**Trigonometry** Convert angles between degrees and radians; revisit special angles and the CAST rule; use and prove a wide variety of trigonometric identities.
4	**Trigonometric Functions** Represent sinusoidal functions graphically and algebraically; graph reciprocal functions; solve trigonometric equations.
5	**Exponential and Logarithmic Functions** Revisit exponential functions and exponent laws; introduce logarithms; graph and transform logarithmic functions; develop and use log laws to simplify logarithmic expressions; solve problems involving exponential and logarithmic functions.
6	**Combinations of Functions** Combine functions studied this year using addition, subtraction, multiplication, division and composition; solve problems involving combined functions.

Assessment and Evaluation:

The primary purpose of assessment and evaluation is to improve student learning. The Achievement Chart for Mathematics will guide all assessment and evaluation.

Assessment and evaluation is divided into two important parts. The grade the student receives on a mid-term or final report indicates achievement/ proficiency in Curriculum Expectations (see box), based on a variety of products, including tests, quizzes and assignments. A level of competence *(Needs Improvement, Satisfactory, Good or Excellent)* will be assessed and reported in the area of Learning Skills and Work Habits: Independent Work, Collaboration, Responsibility, Initiative, Self-Regulation and Organization.

> The **final grade** is determined as follows:
>
> Term work (70%) based on Achievement Chart categories:
> | | |
> |---|---|
> | Knowledge | 25% |
> | Application | 30% |
> | Communication | 5% |
> | Thinking | 10% |
>
> Final Exam   30%

Program Considerations:

Assessment, instructional and environmental accommodations are provided to individual students as per their IEP. Similarly, adaptations for English Language Learners are provided based upon the student's level of language development, strengths and needs.

Homework and Attendance:

Advanced Functions course is a challenging course requiring a very high level of commitment from each student. Students must be prepared to devote regular daily time on home study and review. It is the student's responsibility to catch up on lessons and homework that have been missed. Students should ask classmates for lessons and homework and the teacher can provide any handouts. Students should also consult the math department's website at www.rhhsmath.ca and follow the appropriate links.

Tests and Quizzes:

Tests and Quizzes are based on a unit of work and are always announced in advance. A student who will be missing a quiz or test must make arrangements with the teacher prior to the day of the absence. Failure to do so may result in a mark of zero. Any student who is away due to unforeseen illness must bring a note, signed by a parent or guardian, indicating that they are aware that the student has missed a math test, and the reason for the absence. Failure to do so may result in a mark of zero.

Extra Help:

Teachers will inform students of their availability for extra help. In addition to help from the teacher, students are invited to drop in to the extra help room 2027. This room is open Monday to Thursday from 3:40 pm to 4:20 pm for extra help, and is supervised each day by a math teacher.

Contact information for Students:

Teacher: _____ Email: _____ Office: Room _____

Voicemail: (905)884-2131 ext _____   Website: www.rhhsmath.ca   TeachAssist: http://ta.yrdsb.ca

Two classmates:

Name #1: _____ Tel. _____ email: _____

Name #2: _____ Tel. _____ email: _____