Canterbury High School

Ottawa-Carleton District School Board

Mathematics Department

Semester I – 2010 / 11 – Course Outline

Course Title: Advanced Functions	**Grade Level: 12**
Course Code: MHF4U	**Credit Value: 1.0**
Prerequisite: MCR3U, MCT4C	

Teachers: L. Lithwick, R. Majerovich, J. Vandenberg

Course Overview 110 hours

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.

Strands:

Course Expectations

As students work through the course they will develop a set of skills that will support lifelong learning in mathematics. These skills are a set of seven mathematical processes that are embedded throughout all of the course expectations; they are, problem-solving, reasoning and proving, reflecting, selecting tools and computational strategies, connecting, representing, and communicating. This course will provide students with rich problem-solving opportunities that will help the student develop and apply these processes.

A. 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.

B. Trigonometric Functions

By the end of this course, students will:

1. demonstrate an understanding of the meaning and application of radian measure;
2. 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;
3. solve problems involving trigonometric equations and prove trigonometric identities.

C. Polynomial and Rational Functions

By the end of this course, students will:

1. identify and describe some key features of polynomial functions, and make connections between the numeric, graphical, and algebraic representations of polynomial functions;
2. identify and describe some key features of the graphs of rational functions, and represent rational functions graphically;
3. solve problems involving polynomial and simple rational equations graphically and algebraically;
4. demonstrate an understanding of solving polynomial and simple rational inequalities.

D. Characteristics of Functions

By the end of this course, students will:

1. 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;
2. 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;
3. 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.

Units of Study

1. Polynomial Functions
    - Average & Instantaneous Rates of change
    - Secants and tangents
    - Characteristics of polynomial functions
    - Dividing polynomials
    - Sketching polynomials
    - Solving polynomial equations and inequations

2. Rational Polynomial Functions
    - Rational functions and their characteristics
    - Horizontal, vertical, and oblique asymptotes

3. Trigonometric Functions I
    - Radians and degrees
    - Special angles
    - Graphs of sine, cosine, and tangent using radian measure, as well as the reciprocal trigonometric functions
    - Rates of change

4. Trigonometric Functions II
    - Transformations of trigonometric functions
    - Applications of trigonometric functions
    - Proving trigonometric identities
    - Solving linear and quadratic trigonometric equations

5. Exponential & Logarithmic Functions

    - Characteristics of the exponential function and its inverse, the logarithmic function
    - Evaluation and laws of exponents and logarithms
    - Rates of change of exponential and logarithmic functions
    - Solving exponential and logarithmic equations
    - Solving real world problems graphically and algebraically

Teaching Strategies

Students will have the opportunity to learn in a variety of ways; individually, cooperatively, investigative, teacher directed class discussion and notes, visual aids and manipulatives (e.g., linking cubes, straws).

Assessment and Evaluation Strategies

Student achievement will be monitored through the use of formative assessments in the form of quizzes, assignments, observations. Feedback on these assessments will provide the student with information to determine their level of understanding of the concepts. Student achievement will be recorded through the use of quizzes, tests, assignments/tasks. The percentage grade will represent the quality of the student's overall achievement of the expectations for the course and reflect the corresponding level of achievement as described in the achievement chart.

Evaluation Summary

Term Evaluation (70%) comprised of:

a) Knowledge and Understanding - 24.5%
(understand the concepts and computational skills of specific expectations)

b) Application - 24.5%
(knowing when and how to use appropriate tools and concepts to solve problems)

c) Thinking - 10.5%
(being able to use critical and creative thinking skills to solve problems, connect ideas from other strands)

d) Communication - 10.5%
(reflect and express through writing a mathematical solution or concept)

Summative Evaluation (30%) comprised of:

a) Summative Task (problems using a variety of tools) - 10%

b) Examination - 20%

References

www.edu.gov.on.ca/eng/curriculum/secondary/math1112currb.pdf

Student Resources / Texts

1. Advanced Functions, Nelson, 2008

2. Calculus and Advanced Functions, McGraw-Hill Ryerson, 2002

3. Various other texts and resources (e.g., www.oame.on.ca)