Course Title: Advanced Functions
Course Code: MHF4U1   **Credit Value: 1**
Department: Mathematics   **Prerequisite: MCR3U1**
Level: University Preparation   **Teacher:**
Grade: 12

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 EXPECTATIONS:

- Demonstrate an understanding of the relationship between exponential expressions and logarithmic expressions, evaluate logarithms and apply the laws of logarithms to simplify numeric expressions;
- Identify and describe some key features of the graphs of logarithmic functions, make connections between the numeric, graphical and algebraic representations of logarithmic functions and solve related problems graphically;
- Solve exponential and simple logarithmic equations in one variable algebraically, including those arising from real-world applications
- Demonstrate an understanding of the meaning and application of radian measure;
- 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;
- Solve problems involving trigonometric equations and prove trigonometric identities;
- Identify and describe some key features of polynomial functions and make connections between the numeric, graphical and algebraic representations of polynomial functions;
- Identify and describe some key features of the graphs of rational functions and represent them graphically;
- Solve problems involving polynomial and simple rational equations graphically and algebraically;
- Demonstrate an understanding of solving polynomial and simple rational inequalities;
- 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 at a given point;
- 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;
- 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

HOW THIS COURSE SUPPORTS THE ONTARIO CATHOLIC GRADUATE EXPECTATIONS:

This course encourages the Catholic learner to develop his/her God-given gifts and abilities to promote growth toward personal responsibility in preparation for a chosen career path. Throughout this course, emphasis will be placed on moral, ethical, and realistic decision-making in an effort to build responsible citizenship. The classroom environment will attempt to instil a spirit of cooperation, rather than competition amongst students, and will foster a collaborative sense of community. This course provides many opportunities for students to work effectively as interdependent team members and to acknowledge and respect others for their opinions.

TEXTBOOK/RESOURCES:

Textbook: Advanced Functions (Nelson)	Replacement Value: $75.00
TI-83+ Graphing Calculator	Replacement Value: $100.00

TOPICS AND TIME ALLOCATIONS:

UNIT #	UNIT TITLE	APPROXIMATE # OF PERIODS
1	Characteristics and Properties of Functions	11
2	Rates of Change	8
3	Polynomial Functions	10
4	Polynomials Equations and Inequalities	6
5	Rational Functions, Equations and Inequalities	8
6	Trigonometric Functions	9
7	Trigonometric Identities and Equations	9
8	Exponential and Logarithmic Functions	13
9	Combinations of Functions	8

Evaluation:

Term Work (70% of the final grade)		Final Evaluation (30% of the final grade)	
Category	**Weight**	**Task**	**Weight**
Knowledge/Understanding (Knowledge of content, Understanding of content)	20%	Exam	30%
Thinking (Use of planning skills, processing skills and critical/creative thinking processes)	20%		
Communication (Expression and organization of ideas and information, communication for different audiences, use of conventions, vocabulary and terminology of the discipline in oral, visual and written forms)	10%		
Application (Application of knowledge and skills in familiar contexts, transfer to new contexts, making connections within and between various contexts)	20%		
Final Grade = Term Work (70%) + Final Evaluation (30%)			

Learning Skills: Learning skills are crucial to academic, career and personal success. Students will be assessed continually on the learning skills:

1) **Responsibility**
   - fulfils responsibilities and commitments within the learning environment;
   - completes and submits class work, homework, and assignments according
   - to agreed-upon timelines;
   - takes responsibility for and manages own behaviour

2) **Organization**
   - devises and follows a plan and process 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.

3) **Independent Work**
   - independently monitors, assesses, and revises plans to complete tasks and meet goals;
   - uses class time appropriately to complete tasks;
   - follows instructions with minimal supervision.

4) **Collaboration**
   - accepts various roles and an equitable share of work in a group;
   - responds positively to the ideas, opinions, values, and traditions of others;
   - 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.

5) **Initiative**
   - 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.

6) **Self-regulation**
   - sets own individual goals and monitors progress towards achieving them;
   - seeks clarification or assistance when needed;
   - assesses and reflects 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.

Considerations for Program Planning:

Students with Special Education Needs:

The development of each student's abilities and potential is a shared responsibility. A collaborative model between the classroom teacher and Special Education Department provides services which are delivered primarily within the regular classroom through the classroom teacher. Accommodations such as specialized supports and services will be provided to help the student achieve the expectations, in keeping with the IEP. Students are responsible for working with specific classroom teachers for precise accommodations and responsibilities in each class.

School, Department and Classroom Policies:

- Students who miss a test or a quiz with a legitimate excuse will write it on the first day back.
- Assignments are due on the date assigned by the classroom teacher. Late assignments will be accepted only for an amount of time set by the classroom teacher. Assignments handed in after this date will be recorded as incomplete and can adversely affect the student's final mark.
- Students who, at the end of the semester, have not successfully completed the course, must repeat it or take a course at a different level of difficulty.
- This course is very heavy on content. It is crucial for students to maintain good attendance throughout the course.