Forest Hill Collegiate Institute
Course of Study and Evaluation Statement

Functions (MCR3U), Grade 11: University Preparation

Note 1: All Ontario Ministry of Education curriculum documents with full course content information can be located at
http://www.edu.gov.on.ca/eng/curriculum/secondary/subjects.html

Note 2: Detailed information on Ministry of Education assessment, evaluation, and reporting (2010) can be located at
https://www.edu.gov.on.ca/eng/policyfunding/growSuccess.pdf

1. Course Details
• Program Area: Mathematics
• Course Title: Functions, Grade 11, University Preparation (MCR3U). Credit Value 1.0
• Prerequisites(s): Principles of Mathematics, Grade 10 Academic
• Textbook(s): Functions 11, Nelson

2. Overall Goals
• Course Description:
  This course introduces the mathematical concept of the function by extending students' experiences with linear and quadratic relations. Students will investigate properties of discrete and continuous functions, including trigonometric and exponential functions; represent functions numerically, algebraically, and graphically; solve problems involving applications of functions; investigate inverse functions; and develop facility in determining equivalent algebraic expressions. Students will reason mathematically and communicate their thinking as they solve multi-step problems.

• **Overall Expectations** are in the areas of Characteristics of Functions; Exponential Functions; Discrete Functions; and Trigonometric Functions. By the end of the course, students will:
  • in **Characteristics of Functions**
    * demonstrate an understanding of functions, their representations, and their inverses, and make connections between the algebraic and graphical representations of functions using transformations;
    * determine the zeros and the maximum or minimum of a quadratic function, and solve problems involving quadratic functions, including those arising from real-world applications;
    * demonstrate an understanding of equivalence as it relates to simplifying polynomial, radical, and rational expressions.
  • in **Exponential Functions**
    * evaluate powers with rational exponents, simplify expressions containing exponents, and describe properties of exponential functions represented in a variety of ways;
    * make connections between the numeric, graphical, and algebraic representations of exponential functions;
    * identify and represent exponential functions, and solve problems involving exponential functions, including those arising from real-world applications.
  • in **Discrete Functions**
    * demonstrate an understanding of recursive sequences, represent recursive sequences in a variety of ways, and make connections to Pascal's triangle;
    * demonstrate an understanding of the relationships involved in arithmetic and geometric sequences and series, and solve related problems;
    * make connections between sequences, series, and financial applications, and solve problems involving compound interest and ordinary annuities.
  • in **Trigonometric Functions**
    * determine the values of the trigonometric ratios for angles less than 360°; prove simple trigonometric identities ; and solve problems using the primary trigonometric ratios, the sine law, and the cosine law
    * demonstrate an understanding of periodic relationships and sinusoidal functions, and make connections between the numeric, graphical, and algebraic representations of sinusoidal functions;
    * identify and represent sinusoidal functions, and solve problems involving sinusoidal functions, including those arising from real-world applications.

• **Specific Curriculum Expectations**

Please refer to Ontario Ministry of Education curriculum document for details of Overall and Specific Expectations, found at http://www.edu.gov.on.ca/eng/curriculum/secondary/math1112curr.pdf

3. Program Planning Considerations

• *Individual Education Plan*: Accommodations to meet the needs of exceptional students as set out in their Individual Education Plan will be implemented within the classroom program. Additional assistance is available through the Special Education program.
• *The Role of Technology in the Curriculum.* Using information technology will assist students in the achievement of many of the expectations in the curriculum regarding research, written work, analysis of information, and visual presentations. The computer and the calculator are important problem-solving tools to be used for many purposes. Computers and calculators are tools of mathematicians, and students will be given opportunities to select and use the particular applications that may be helpful to them as they search for their own solutions to problems.
• *English As a Second Language (ESL)*: Appropriate accommodations in teaching, learning, and evaluation strategies will be made to help ESL students gain proficiency in English, since students taking ESL at the secondary level have limited time in which to develop this proficiency. Teachers will ensure that reading levels are appropriate to students' abilities and will strive for clarity in the use of mathematical terminology.
• *Career Education*: Expectations in the English program include many opportunities for students to apply their language skills to work-related situations, to explore educational and career options, and to become self-directed learners. Regardless of their post secondary destination, all students need to realize that literacy skills are employability skills.
• *Cooperative Education and Other Workplace Experiences:* The knowledge and skills students acquire in this courses will assist them in their senior level cooperative-education and work-experience placements related to this course. General information about cooperative education courses can be found at http://www.edu.gov.on.ca/eng/document/curricul/secondary/coop/cooped.pdf

4. Learning Skills

Learning Skills are skills and habits are essential to success in school and in the workplace. The Learning Skills evaluated are: **Responsibility**, **Organization**, **Independent Work, Collaboration, Initiative, Self-Regulation**. Teachers report achievement on the six Learning Skills using letter symbols: **E = Excellent, G = Good, S = Satisfactory, N = Needs Improvement.**

Learning Skills clearly affect levels of achievement, but they are *not* part of the evaluation of achievement and are not included in the midterm mark or final course mark.

5. Academic Honesty: Cheating and Plagiarism

Students are expected to submit only their own original work on evaluations done in class or out of class. Plagiarism is the passing of the ideas or writings of another as one's own. Cases of academic dishonesty (cheating and/or plagiarism) will be dealt with on a case-by-case basis, but each case will involve an investigation, communication with the student and his/her parent/guardian, and a mark of zero for the plagiarized work. Whether the student has an opportunity to demonstrate his/her learning in another assignment will be at the discretion of the teacher and/or Principal.

6. Teaching Strategies

Teachers use a variety of teaching strategies to maximize student learning. The following teaching strategies will be used in this course:

• *Direct Instruction* is highly teacher-directed. This strategy includes methods such as lecture, didactic questioning, explicit teaching, practice and drill, and demonstrations.
• *Indirect Instruction* is mainly student-centred. Indirect Instruction includes inquiry, induction, problem solving, decision making, and discovery.
• *Interactive Instruction* relies heavily on discussion and sharing among participants. Interactive instruction may include total class discussions, small group discussions or projects, or student pairs or triads working on assignments together.
• *Experiential Learning* is inductive, learner centred, and activity oriented. In Experiential Learning, students participate in an activity; critically look back on the activity to clarify learnings and feelings; draw useful insights from such analysis; and/or put learnings to work in new situations.
• *Independent Study* refers to the range of instructional methods which foster the development of individual student initiative, self-reliance, and self-improvement. The focus is on planned independent study by students under the guidance or supervision of a classroom teacher.

7. Assessment and Evaluation Strategies
Assessment and Evaluation of Student Achievement
The primary purpose of assessment and evaluation is to improve student learning. Assessment is the process of gathering information from assignments, demonstrations, projects, performances, and tests that accurately reflects how well a student is achieving the curriculum expectations in a course. As part of assessment, teachers provide students with feedback that guides their efforts towards improvement.

Evaluation refers to the process of judging the quality of student work on the basis of established criteria, and assigning a value to represent that quality. In Ontario secondary schools, the value assigned will be in the form of a percentage grade.

- In this course, the following evaluation strategies may be used: *homework, assignments, in-class activities, quizzes, tests, and final exam*

8. Achievement Chart
The achievement chart provides a standard, province-wide method for teachers to use in assessing and evaluating their students' achievement. Students are evaluated according to the major categories or strands in each course. Ministry curriculum documents provide detailed description of student achievement levels.

In this course, students are evaluated in four strands, according to the weightings shown:

Knowledge/Understanding	Thinking/Inquiry	Communications	Application
30%	20%	20%	30%

9. 70% Mark on Course Work
- Students need to demonstrate achievement of all the overall expectations of the course. 70% of the final mark in the course will be based on work done prior to the culminating activities. Evaluations that are late, missing, and/or incomplete will affect a student's 70% grade. See FHCI Evaluation Policy as printed in the Student Agenda Book for information about late, missed, and/or incomplete assignments.

10. 30% Grade Based on Course Culminating Activities
- All students must take part in the culminating activities for each course at every grade and level of study. The steps to follow when a student is absent from one or more culminating activities is included in the FHCI evaluation policy as printed in the Student Agenda Book.
- Culminating activities that occur in class are held within the last three weeks of classes. Culminating activities that are formal examinations occur within the last nine days of the semester

11. Determining Marks for the Midterm Provincial Reports in November and April
This grade will be based on the evaluations that have been conducted to the midterm point in the course. Some of the Overall Expectations, categories/strands, and units will not have been addressed by the midterm, and the students' grades will most likely change when the students' entire work is evaluated by the end of the course.

12. Determining the Mark for the Final Report Card
The mark for the final will report card will be the sum of the 70% term mark and the 30% exam mark.

13. Missed tests/quizzes policy
If a student is legitimately absent for a test or quiz, upon return to school, they must have a doctor's note or a note from their parent or guardian stating the reason for their absence. At that time, and at the convenience of the teacher, the student may write a makeup test. If a student does not have a valid reason for his/her absence, **a mark of zero will be given**. *Every effort will be made by the subject teacher to notify students well in advance of scheduled test dates.*

Definition of Legitimate Absence
- Illness with a doctor's note
- Death in the family
- Medical appointment (Advance notice required)
- Religious reasons (Advance notice required)
- School authorized field trip (Advance notice required)
- Court appearances (Advance notice required)

14. Teacher Contact: 416-393-1860 Ext. 20080

FUNCTIONS, GRADE 11 (MCR3U): UNIVERSITY PREPARATION
STUDENT'S COURSE OUTLINE

Chapter 1: Introduction to Functions

SECTION	TITLE	HOMEWORK EXERCISE
1.1	Relations and Functions	Pg 10 #1-7, 9, 12-13
1.2	Function Notation	Pg 22 #1-12, 17
1.4	Determining the Domain and Range of a Function	Pg 35 #1-4, 7, 9, 11, 14
	Investigation: Properties of Functions Defined by $f(x) = \sqrt{x}$ and $f(x) = \dfrac{1}{x}$	Worksheet
1.5	The Inverse Function and its Properties	Pg 46 #1, 3-6, 9-10
1.7	Investigating Horizontal Stretches, Compressions, and Reflections	Pg 58 #8, 11, 12 Worksheet
1.8	Using Transformations to Graph Functions of the Form $y = af\big[k(x-d)\big] + c$	Pg 70 #3-4, 6-9, 18, 20
Review		Chapter 1 Review Practice Questions Pg 76-77
Unit Evaluation		

Chapter 2: Equivalent Algebraic Expressions

SECTION	TITLE	HOMEWORK EXERCISE
2.1	Adding and Subtracting Polynomials	Pg 88 #1, 4-7, 11-13
2.2	Multiplying Polynomials	Pg 95 #1-7, 9-12
2.3	Factoring Polynomials	Pg 102 #1-9, 12, 14
2.4	Simplifying Rational Expressions	Pg 112 #1-5, 7-8, 10, 14
2.6	Multiplying and Dividing Rational Expressions	Pg 121 #1-10, 13
2.7	Adding and Subtracting Rational Expressions	Pg 128 #1-12
Review		Chapter 2 Review Practice Questions Pg 132-133
Unit Evaluation		

Chapter 3: Quadratic Functions

SECTION	TITLE	HOMEWORK EXERCISE
3.4	Operations with Radicals Supplementary: Rationalize denominator	Pg 167 #1-12, 15 Handout
3.1	Properties of Quadratic Functions	Pg 145 #1-8, 11-13, 15-16
3.2	Determining Maximum and Minimum Values of a Quadratic Function	Pg 153 #1-4, 8-11, 15
3.3	The Inverse of a Quadratic Function	Pg 160 #1-6, 10
3.5	Quadratic Function Models: Solving Quadratic Equations	Pg 177 #1-6(ac), 7-14
3.6	The Zeros of a Quadratic Function	Pg 185 #1-3, 6-10, 17
3.7	Families of Quadratic Functions	Pg 192 #1-6, 9
3.8	Linear - Quadratic Systems	Pg 198 #1-6, 10-11
Review		Chapter 3 Review Practice Questions Pg 202-203
Unit Evaluation		

Chapter 4: Exponential Functions

SECTION	TITLE	HOMEWORK EXERCISE
4.1	Exploring Growth and Decay	Pg 216 #1
4.2	Working with Integer Exponents	Pg 221 #1-9, 11, 13, 16, 18
4.3	Working with Rational Exponents	Pg 229 #1-6, 12, 14
4.4	Simplifying Algebraic Expressions Involving Exponents	Pg 235 #1-9, 15
4.5	Exploring the Properties of Exponential Functions	Pg 243 #1, 2
4.6	Transformations of Exponential Functions	Pg 251 #1-6, 9, 11-14
	Supplementary: Solving Exponential Equations (introduce *log* to solve equations with different bases)	Handout
4.7	Applications Involving Exponential Functions	Pg 261 #1-6, 9-16
Review		Chapter 4 Review Practice Questions Pg 267-269
Unit Evaluation		

Chapter 5: Trigonometric Ratios

SECTION	TITLE	HOMEWORK EXERCISE
5.1	Trigonometric Ratios of Acute Angles	Pg 280 #1-8, 11-12, 15
5.2	Evaluating Trigonometric Ratios for Special Angles	Pg 286 #3-7, 9, 11, 13
5.3	Exploring Trigonometric Ratios for Angles Greater than 90º	Pg 292 #1-4
5.4	Evaluating Trigonometric Ratios for any Angle between 0º and 360º	Pg 299 #1-12
5.5	Trigonometric Identities	Pg 310 #1-5, 7-8, 10-12
5.6	The Sine Law	Pg 318 #1-10
5.7	The Cosine Law	Pg 325 #1-5, 7-8, 10
5.8	Solving Three-Dimensional Problems by Using Trigonometry	Pg 332 #1-8, 13
Review		Chapter 5 Review Practice Questions Pg 338-339
Unit Evaluation		

Chapter 6: Sinusoidal Functions

SECTION	TITLE	HOMEWORK EXERCISE
6.1	Periodic Functions and Their Properties	Pg 352 #1-4, 7-10
6.2	Investigating the Properties of Sinusoidal Functions	Pg 363 #2, 3, 7, 9, 11, 12
6.3	Interpreting Sinusoidal Functions	Pg 370 #1, 2, 4, 6, 13
6.4	Exploring Transformations of Sinusoidal Functions	Pg 379 #1-3
6.5	Using Transformations to Sketch the Graphs of Sinusoidal Functions	Pg 383 #1, 2, 4, 5, 7
6.6	Investigating Models of Sinusoidal Functions	Pg 391 #1, 3, 4, 6, 7
6.7	Solving Problems Using Sinusoidal Models	Pg 398 #1-6, 9
Review		Chapter 6 Review Practice Questions Pg 404-405
Unit Evaluation		

Chapter 7: Discrete Functions: Sequences and Series

SECTION	TITLE	HOMEWORK EXERCISE
7.1	Arithmetic Sequences	Pg 424 #1-6, 10, 12, 13, 15
7.2	Geometric Sequences	Pg 430 #1-5, 8, 11
7.3	Creating Rules to Define Sequences	Pg 439 #1, 2, 5, 7
7.4	Exploring Recursive Sequences	Pg 443 #3
7.5	Arithmetic Series	Pg 452 #1-7, 9, 11
7.6	Geometric Series	Pg 459 #1-6
7.7	Pascal's Triangle and Binomial Expansions	Pg 466 #1-5
Review		Chapter 7 Review Practice Questions Pg 468
Unit Evaluation		