



## **Functions 11** **Grade 11, University Preparation (MCR3U)**

**Prerequisite** – Principles of Mathematics, Grade 10, Academic (MPM2D)

**Credit** – 1.0

**Teacher** – Mr. Nathan Oldridge

**Email** – [nathanoldridge@torontoprepschool.com](mailto:nathanoldridge@torontoprepschool.com)

**Textbook** – Functions 11 (2009). Meisel et al., McGraw-Hill Ryerson.

**Extra-Help** – Every morning from 9:00 to 9:50 or by appointment in the afternoon

### **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.

| <b>Unit</b>  | <b>Length</b> |
|--|---------------|
| Unit 1: Quadratic Functions                          | 20 hours      |
| Unit 2: Exploring Functions                          | 20 hours      |
| Unit 3: Exponential Functions                        | 15 hours      |
| Unit 4: Trigonometry                                 | 20 hours      |
| Unit 5: Trigonometric Functions                      | 20 hours      |
| Unit 6: Sequences, Series and Financial Applications | 15 hours      |
| Total  | 110 hours     |

### **Topics of Study**

#### **Unit 1 – Quadratic Functions (20 hours)**

- Students investigate quadratic functions and related concepts from algebraic and geometric perspectives
- Students apply the method of completing the square in order to solve maximum/minimum problems involving quadratic functions.
- Algebraic and graphical methods are used to determine the roots of quadratic equations.

**Unit 2 – Exploring Functions (20 hours)**

- Students are introduced to the definition of a function and the notations associated with it.
- Students explore the domain and range of functions, inverses, and transformations.
- Students solve first-degree inequalities and graph their solutions on number lines. Skills involving operations with polynomials and rational expressions are consolidated, and then extended to the complex number system, which is introduced in this unit.

**Unit 3 – Exponential Functions (15 hours)**

- The exponent laws are applied to expressions which have powers containing integer and rational exponents.
- Students discover the nature of exponential functions and solve exponential equations

**Unit 4 - Trigonometry (20 hours)**

- Students consolidate and extend concepts first introduced in Grade 10. Students use the primary trigonometric ratios, the sine law, and the cosine law to model and solve two- and three-dimensional problems involving acute, right, and oblique triangles.
- Students investigate the relationship between degree and radian measure, and explore the use of the unit circle and special triangles to determine selected values of the primary trigonometric ratios.

**Unit 5 - Trigonometric Functions (20 hours)**

- Students investigate the periodic nature and graphical properties of the primary trigonometric functions.
- Students explore the effects of simple transformations on their graphs and equations.
- Students apply these concepts to model authentic problems

**Unit 6 – Sequences, Series and Financial Applications (15 hours)**

- Students investigate arithmetic and geometric sequences and series.
- Students apply skills with linear and exponential functions.
- Students develop the formula for compound interest and solve problems related to compound interest and annuities.

**Overall Course Expectations**

- **Quadratic Functions**
  - Determine the zeros and the maximum or minimum of a quadratic function, and solve problems involving quadratic functions, including problems arising from real-world applications
  - Demonstrate an understanding of equivalence as it relates to simplifying polynomial, radical and rational expressions
- **Exploring Functions**
  - Demonstrate an understanding of functions, their representations, and their inverses, and make connections between the algebraic and graphical representations of functions using transformations
- **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 problems arising from real-world applications
- **Trigonometry**
  - Determine the values of the trigonometric ratios for angles less than  $360^\circ$
  - Prove Simple trigonometric identities and solve problems using primary trigonometric ratios, the sine law and the cosine law
- **Trigonometric Functions**
  - 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 problems arising from real-world applications

- **Sequences, Series and Financial Applications**
  - 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

## Required Materials

- 3-ring binder
- Lined and blank paper
- Pens, pencils, an eraser, a calculator, and ruler

Note that for day-to-day use, we recommend the Sharp EL-500, and for graphing we recommend Texas Instruments TI series. If a student chooses to use a TI-series calculator on an evaluation, the teacher will clear the memory before the test begins.

## Academic Due Dates

All homework, assignments, and projects will have a **due date** and a **window of opportunity date**.

The **due date** represents the date in which the assignment/lab/project is due. Students should submit the homework/assignment/project to their teacher on the due date. If a student does not submit the task on the due date, the teacher will contact the parents/guardian to notify them of the student's outstanding work. The teacher **will not** provide support after the due date has passed.

The **window of opportunity date** represents the final date in which the subject teacher will accept the homework/assignment/project. All work submitted on the original due date will also be returned to the students on this day. The window of opportunity date will be different depending on the task but it, along with the due date, will always be clearly communicated to the class.

## Assessment and Evaluation

Course work (tests, quizzes, laboratories, and assignments) will account for 70% of your final mark. There will be a small course-culminating activity at the end of the term, accounting for 5% of your final mark. The remaining 25% of your mark will derive from a written exam at the end of the course.

| Classification              | Approximate Weight |
|-----------------------------|--------------------|
| Knowledge and Understanding | 40%                |
| Application                 | 25%                |
| Thinking and Inquiry        | 20%                |
| Communication               | 15%                |

## Course Information

This class has a Wiki site that will contain important dates, class handouts, some class notes, and hopefully some student-generated content, found at <http://tps-mcr3u-oldridge-fall2011.wikispaces.com/>