# Concordia Faculty of Arts and Science
# SFYX-Math 203-53 Fall 2019

Instructor: Dr. Fred E. Szabo
Assistants: Hassan Harb and Dalia El-Farawi
Office hours: By appointment or ZOOM-based teleconferencing (*)

## Course description and outline

- First-year Science Experiment (SFYX) Special Version of Calculus Math 203
- Open to 2019 SFYX science students and regular Concordia undergraduate students full-filling the admission requirements for Math 203, offered by the Department of Mathematics and Statistics.
- All students are required to participate in **one o**f the following **tutorials** customized for SFYX-Math 203:
  - **Math 203-5301 , Monday 1:15 to 2:30, CC 405 LOY**
  - **Math 203-5302, Monday 2:45 to 4:00, CC 405 LOY**
  - **Math 203-5303, Monday 4:15 to 5:30, CC 405 LOY**
- All students are required to participate in the **lectures** for SFYX-Math 203:
  - **Math 203-53, Wednesday, 6:00 to 8:30, CC 320 LOY**
- All work in this course is laptop-based and requires Mathematica.
- The enrollment capacity of this course is set by the Faculty of Arts and Science. Since this course is a mathematics component of the SFYX initiative. Non-SFYX students may take this course provided that space is available.
- The enrollment capacity of the tutorials is 30 students per tutorial. All three weekly tutorials cover identical content. All tutorials are interactive and require student laptops. Enrollment in the tutorials is first-come-first served, and students can choose the tutorial that suits their agenda if space is available.
- **All students must complete one tutorial per week if a tutorial is given.**
- SFYX Math 203-53 is academically equivalent to Math 203 as offered by the Department of Mathematics and Statistics and meets all of the curricular objectives of the regular version of Math 203.

# Course objective

- **Interactivity** based on Wolfram Mathematica
- Extensive use of **graphic learning tools** to deepen understanding
- Preparing for **next-gen thinking and computational reasoning**
- Making calculus relevant, enjoyable, accessible, and learnable
- All t**utorials and lectures will be interactive** and are based on the textbook:
  - Mathematica-based interactive electronic CALCULUS by Briggs, Cochran, Gillett, Schulz
- The teaching and learning components of the course are
  - Moodle, MYLABMATH (linked to Moodle), and Mathematica (free download from MyConcordia)
- Assessments (exercises, quizzes, examinations) use MYLABMATH
- **Projects** are written as interactive slide shows in Mathematica. Sample projects written by former students will be provided and templates will be posted.
- Project resources are based on the work of Hassan Harb and Dalia El-Farawi, prepared in the summer of 2019.
- In addition to face-to-face interactions with all students, virtual assistance is available through video-conferencing with **ZOOM**, used in compliance with the Concordia Guidelines for electronic communication between students and professors. All students will be assigned to either Hassan or Dalia for immediate help and assistance.
- The ten r**eflections** are answers to the following two questions, written by completing reflection templates. Students have fifteen minutes at the end of a lecture to write and post their answers. Reflections must be spontaneous and written in class.
  - Question 1
    - *Summarize in words what you have learned from today's lecture and from your participation in the class.*
  - *Question 2*
    - *Summarize in words how what you have learned today fits into your previous knowledge or how you think you might be able to use it in the future.*
- Past students have found the writing of reflections an enjoyable and rewarding experience. Reflections also fit well into the goals and style of the SFYX approach to teaching and learning. The students who wrote them in other courses found that the writing of reflections promotes **understanding** and **retention** of course material, encourages **exploration,** and fosters **curiosity**.
- **Posted reflections count for one mark each towards the final grade and are confidential to the student who wrote them.**

# Week 1

## Tutorial 1

- **Labour Day - no tutorial**

## Lecture 1

Getting ready for calculus

- Scientific awareness check
- Thinking big: infinity is everywhere
- Calculus through the ages

# Week 2

## Tutorial 2 (September 9)

- **Reading list for Lesson 2**
- **Review of Math 203 qualifying test**
- **MYLABMATH introduction**

## Lecture 2 (September 11)

- Review of functions (1.1)
- Representing functions (1.2)
- Trigonometric functions (1.3)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 1**
- **Reflections 1**

# Week 3

## Tutorial 3 (September 16)

- **Reading list for Lesson 3**
- **Limits: left and right, at infinity, infinite limits**
- **MyLabPractice practice session**

### Lecture 3 (September 18)

- Definition of limits (2.2)
- Technique of computing limits (2.3)
- Infinite limits and limits at infinity (2.4, 2.5)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 2**
- **Reflections 2**

## Week 4

### Tutorial 4 (September 23)

- **Reading list for Lesson 4**
- **MYLABMATH practice session**

### Lecture 4 (September 25)

- Continuity (2.6)
- Introducing the derivative (3,1)
- The derivative as a function (3.2)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 3**
- **Reflections 3**

## Week 5

### Tutorial 5 (September 30)

- **Reading list for Lesson 5**
- **MYLABMATH practice session**

### Lecture 5 (October 2)

- Rules of differentiation (3.3)

- The product and quotient rules (3.4)
- Derivatives as rates of change (3.6)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 4**
- **Reflections 4**

# Week 6

## Tutorial 6 (October 7 - Thanksgiving)

- **No tutorial**

## Lecture 6 (October 9)

- The chain rule (3.7)
- Implicit differentiation (3.8)
- Related rates (3.9)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 5**
- **Reflections 5**

# Week 7

## Tutorial 7 (October 14)

- **Mathematica presentation notebooks**
- **MYLABMATH practice session**

## Lecture 7

- **Midterm examination**
- **Discussion of the course projects**
  - **Purpose**
  - **Form and Content**
- **Presentation and discussion of past projects**

# Week 8

## Tutorial 8 (October 21)

- **Reading list Lesson 8**
- **MYLABMATH practice session**

## Lecture 8 (October 23)

- Maxima and minima (4.1)
- Mean value theorem (4.2)
- Graphing functions (4.4)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 6**
- **Reflections 6**

# Week 9

## Tutorial 9 (October 28)

- **Reading list for Lesson 9**
- **MYLABMATH practice session**

## Lecture 9 (October 30)

- Optimization problems (4.5)
- Linear approximation and differentials (4.6)
- Newton's method (4.8)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 7**
- **Reflections 7**

# Week 10

## Tutorial 10 (November 4)

- **Reading list for Lesson 10**
- **MYLABMATH practice session**

## Lecture 10 (November 6)

- Inverse functions (7.1)
- The natural logarithmic and exponential functions (7.2)
- Logarithmic and exponential functions with other bases (7.3)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 8**
- **Reflections 8**

# Week 11

## Tutorial 11 (November 11)

- **Reading list for Lesson 11**
- **MYLABMATH practice session**

## Lecture 11 (November 13)

- Exponential models (7.4)
- Inverse trigonometric functions (7.5)
- L'Hopital's rule and growth rates of functions (7.6)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 9**
- **Reflections 9**

# Week 12

## Tutorial 12 (November 18)

- **Reading list for Lesson 12**
- **MYLABMATH practice session**

## Lecture 12 (November 20)

- Basic idea of differential equations (9.1)
- Separable differential equations (9.3)
- Modeling with differential equations (9.5)
- **Applications of calculus in science and elsewhere**
- **MYLABMATH-based Assignment 10**
- **Reflections 10**

# Week 13

## Tutorial 13

- **Final examination preparation**
- **MYLABMATH final examination practice**

## Lecture 13

- **Project celebration week**

# Grading scheme

1. Reflections - 10 marks
2. Midterm examination - 20 marks
3. Illustration of Applications of calculus in science and elsewhere Assignments - 20 marks
4. Project (Take-home examination part) - 20 marks
5. Final examination (2-hour proctored MYLABMATH examination part) - 30 marks

# Disclaimer

(*) The use of the teleconferencing tool ZOOM in this course is made possible by the Concordia licence for this product. Using ZOOM by Concordia faculty and students is subject to the Concordia Educational Technology Guidelines that can be found at https://www.concordia.ca/offices/ctl/-concordia-university-educational-technology-guidelines-for-faculty-and-students.html.