Mathematics for Economists I

Ap/Econ 1530, sections B & J, Fall 2020

- **Motivation**
  Mathematics is the language of choice for economists.

The purpose of economics as a field is to help us understand and navigate the world of (economic) human behavior. To do that, economists need a way, a language to describe the world and human behavior, human choices. The most convenient language for that is the language of mathematics:

- Using numbers, economists can count, e.g., number of firms, inventory hold, pieces of information shared, etc.
- Using functions, we can express relationships, such as between income, education level, and life expectance or between foreign investments, domestic infrastructure, and GDP.
- With optimization methods we can more precisely describe the choices made by consumers, firms, and governments.
- Comparative statics help us predict how those optimal choices change as the environment and the context changes.
- Finally, vectors and matrices (which will be covered in Econ 1540) are an extremely convenient short-hand notation to organize and manipulate data, e.g., the number of people employed in various sectors of the economy over time.

The language of math is understood world-wide.

Strengthening your mathematical skills has three benefits: (1) It increases your proficiency in the language of mathematics. As a result, you will be a better student of economics and, eventually, a producer of better economic arguments. (2) It strengthens your abstraction skills. Building on these skills, it will be easier for you to acquire other (highly valuable) technical skills such as programming or data analysis skills. (3) It helps you further develop a sophisticated understanding of reality. As a result, you will be better able to detect patterns, discern risks, and make better decisions in your personal and professional life.

- **Why**
  you will benefit from Econ 1530

- **How**
  you will achieve those benefits.

One learns math only by doing it. You develop mastery of mathematical tools by engaging with the material and solving practice problems. That is why this course is designed to engage you with the material and our learning community and to offer lots of practice opportunities.

- **What**
  we will cover in this course.

In this first part of mathematics for economists, we master functions of one variable, learn differentiation and integration, as well as single-variable optimization.

Learning Objectives,

As a successful student, at the end of this course you will

Foundational Knowledge	• Have developed a thorough mastery of the mathematical tools covered. • Be able to execute manipulation of formal expression and to reliably solve mathematical and formal economic problems.
Integration and Application	• Be able to connect mathematical notation to real-world observations. • Be able to use mathematical tools to capture essential aspects of real-world observations and critically assess their limitations.
Professional Development	• Have developed confidence and proficiency in using mathematical language to express relationships, observations, etc. • Be able to translate between mathematical language and plain English.

Course Structure,

The course consists of an introduction and four modules, with the following content:

0. Introduction week 1	• Learn to navigate Moodle and ALEKS • Introduce yourself to your classmates and get to know your instructor. • Understand the course outline, course components and expectations.
I. Pre-Calculus Algebra weeks 2-4	• Understand, interpret, and work with algebraic expressions. • Execute and apply solving of one/two linear and quadratic equations. • Understand, interpret, characterize, and graph functions of one variable.
II. Differentiation week 5-7	• Understand and be able to explain the geometry of differentiation. • Understand and be able to explain differentiation as change. • Correctly apply differentiation to a variety of functions. • Understand and reliably apply key rules of differentiation.
III. Applications of differentiation week 8-10	• Understand, interpret, and work with polynomial approximations. • Understand and calculate elasticities. • Understand, interpret, and execute single-variable optimization.
IV. Integration week 11-12	• Understand and be able to explain the geometry of integration. • Understand and be able to explain integration as aggregation. • Correctly apply integration to a variety of functions. • Understand and reliably apply key rules of integration.

and Course Components

You can earn 100 points or marks in this course. In each module, you can earn 25 points: 10 for participation and 15 for demonstrating mastery. You can also earn 2 bonus marks in each module by submitting a comprehensive info-graphic 2 days before the respective first test day.

Participation
40 points
10 per module

Participation is important in this course: It supports your learning progress and makes you part of our learning community.

- Each week you are asked to contribute to a group discussion forum, e.g.,
  - By explaining some terminology,
  - By demonstrating the solution of a practice problem,
  - By discussing an application of a mathematical concept.
- At the end of each module, your contributions to your group discussions will be evaluated. You will earn 2 points for satisfying each of the five criteria:
  - participation-activity in the first week of the module completed.
  - participation-activity in the second week of the module completed.
  - participation-activity in the third week of the module completed.
  - demonstrates effort and engagement with each assignment.
  - engages in discussions with other students through thoughtful comments and responses.
- Please make sure to read the activity instructions carefully and fulfill all aspects of the activity. For example, if the activity asks you to post a picture and comment on it, it is not enough to just post an image.

Mastery
60 points
15 per module

Demonstrate:
- *comprehension* of mathematical terminology
- *ability to apply* concepts,
- *capability to manipulate* formal expressions and *to reliably solve* mathematical and formal economic problems.

- For each module, you have two options to demonstrate mastery:
  - 1st and 4th module: two online test dates.
  - 2nd and 3rd module: online test, writing assignment.

Module	Where	Term Test		Writing Assignment: receive … if submitted by		
		1st date	2nd date	grade and comments	grade, no comments	Pass/Fail, no comments
1	ALEKS	Oct 3rd	Oct 6th	---		
2	Moodle	Nov 7th	---	Nov 16th	Nov 23rd	Dec 9th
3	Moodle	Nov 28th	---	Dec 9th	Dec 16th	Dec 21st
4	Moodle	During Final Period		---		

- The term tests include multiple choice, short-answer, and numeric questions.
- Online tests are open book. Calculators are allowed.
- Writing assignments are made available on Moodle with the respective module.

Course Format

Asynchronous.

Each student learns the material according to their own schedule and availability.

This course runs completely asynchronously. Students can access the course material and complete the assignments on their own schedule. There are no synchronous activities.

Same-paced.

Students progress through the course together, completing the same assignments each week.

We start and finish each module together. Within each module there is some flexibility to work ahead or catch up, though generally all students complete the same activities each week.

Module-based.

Our course is structured around modules.

Our course consists of four modules. Each module in turn has three phases: learning the terminology, understanding the concepts, and practising the concepts. Each phase is typically weeklong. During that week there will be range of activities students complete across a range of modalities: reading, writing, explaining, computing, explaining, listening, and reflecting. This range of activities strengthens the neural networks that form the basis of your learning.

Course Policies.

Email Policy and Etiquette.

Email is not an effective way to discuss economics or mathematics.

Instead, attend digital office hours or post on the "Questions? Answers!" section in our Moodle course. If you have a concern, others will share your concern. I am checking questions posted in the "Questions? Answers!" section frequently and typically answer questions posted there before responding to emails. The "Questions? Answers!" section is our course repository of clarifications, tips, strategies, and answers.

Please reserve email communication for brief personal questions and concerns. When you email, please
- follow the guidelines for emailing your instructor posted on Moodle.

- do include Econ1530 in the subject line.
- be as specific as possible.
- do not send attachments unless requested.

I strive to reply to e-mail within 48 hours, except on weekends. Emails between instructors and students constitute professional communication; please treat them as such. If you are not sure what constitutes professional communication, please refer to the "Guideline on emailing an instructor" posted on Moodle.

Missed Midterms.

If you miss the first online test date, you must write the writing assignment or the second online test, respectively, to earn a grade.

If you miss both test dates or fail to submit the writing assignment by the due date, you will automatically receive a mark of zero.

That is why I strongly encourage you to make use of the first test date whenever possible - if you miss it, you can take the test at the second date.

Missed Participation.

No make-up credit will be given for any reason for missed participation.

Rounding Policy.

To arrive at your final mark, I will round your final score to the nearest integer, e.g., an overall score of 69.4 is a final mark of 69. No exceptions.

Appealing a Grade

Students can appeal test grades and grades for the midterm by submitting an electronically fillable Test Remark Request form available through the Moodle website. Please note that following an appeal, your test score can increase, decrease, or stay constant.

> ! You do not need to submit documentation. It is your choice how you demonstrate mastery.

> You must submit any appeals within two weeks of the grade having been posted

Academic Integrity.

- **Why**

  Upholding high standards of Academic Integrity is essential for successful academic discourse, and to the pursuit of learning and scholarship. Respecting and enforcing these standards at our University also ensures that the degree you earn from York University is a strong signal your learning and academic achievement.

- **How**

  You uphold high standards of Academic Integrity by:
  - doing and submitting only your own work
  - not permitting others to use your answers
  - giving credit to others for their ideas and works
  - quoting your sources, correctly paraphrasing and summarizing

- **More Information**

  If you have questions or concerns about what constitutes appropriate academic behaviour, please consult with me or seek additional resources.

- **Enforcement**

  York University takes its responsibility to uphold high academic standards very seriously. The [Senate Policy on Academic Conduct](#) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Sanctions in cases of cheating can include temporary and permanent records on your transcript, suspension from the course, up to suspension from the University.

- **Not up the instructor**

  If I observe behaviour that might involve academic dishonesty, I am required to report it. It is not up to me to judge whether the behavior was unintended, a minor infraction, a first-time infraction, etc. I am professionally bound to report any suspicious behavior.

- **Turn-it-in**

  To promote academic integrity in this course, students who opt into a writing assignment for module 2 and/or module 3 will be required to submit their written assignments to Turnitin (via the course Moodle) for a review of textual similarity and the detection of possible plagiarism. In so doing, students will allow their material to be included as source documents in the Turnitin.com reference database, where they will be used only for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin service are described on the Turnitin.com website.
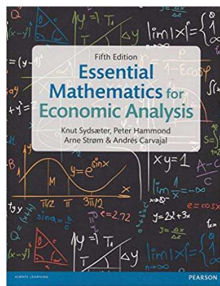
You Need ….

Pen and Paper. Pencil and Eraser.

Handwriting is demonstrably more effective in helping you learn than typing notes. Even when reading an e-book, practicing with ALEKS, or watching a video online, it will be helpful for you to take handwritten notes in your own words.

Knut Sydsaeter, Peter Hammond, Andrés Carvajal:
Essential Mathematics for Economic Analysis

We will closely follow chapter 1-9. Each module, there will be assigned reading from the textbook. Each week, we will engage with the textbook in another activity. You are especially encouraged to work through the practice questions worked out in the book. Many quiz and midterm are similar to those practice questions.

8 hours of time. Every week.

Full time student = full time work. So: 5 courses = 40 hours each week. As the instructor I thus design the course such that the average student can perform satisfactorily (= C) by spending 8h each week.

I am aware that many of you take six courses, work part- or full-time, are involved in clubs, and/or have family obligations. Please be aware of your opportunity cost and work effectively with the time you have.

ALEKS access

It's a highly adaptive program and allows you to progress through the first module of our course at the exact right pace so you are neither bored nor overwhelmed.

Patience and a Sense of humor
Learning mathematics is a process that takes time. Transitioning to online learning and into the role of a college student is a process that takes time. Be patient and kind with yourself.

Technical Requirements.

Several platforms will be used in this course (e.g., Moodle, Zoom, etc.) through which students will interact with the course materials, the course director/TA, as well as with one another.

To successfully participate in this course, you will need:

Hardware

- a laptop or desktop in good working order. You will not be able to complete course assessments with just a tablet or smartphone.
- a webcam with microphone or smartphone for our Zoom meetings.
- a camera with which to take pictures of your work to upload to our Moodle website.
- a reliable internet connection.

Software

- Moodle. This is our course website. It is provided by York University.
- ALEKS. You will need a six-week subscription to ALEKS to complete term test 1. The cost of a six-week subscription is $39.00 (no tax). A subscription for the entire semester (18 weeks) is $79.00. You can purchase a subscription at the York U bookstore https://www.bookstore.yorku.ca/sell access codes.asp. (Scroll down to ECON1530.)
- Gapminder.org. The gapminder foundation works toward spreading a fact-based worldview. They have also brought some of the most easily accessible data online. We will use their (free) tools to link mathematical concepts to real-world applications.
- Zoom. Zoom is available to all York students for free. https://yorku.zoom.us/
- MS Word. For two of the four modules you will have a choice to demonstrate your mastery through an online test or through a writing assignment. To complete the writing assignments, you will need MS Word. It is available to all York students at https://uit.yorku.ca/student-services/software/.

Students shall note the following:

Note

Please review the [technology requirements and FAQs for Moodle](#).

- Zoom is hosted on servers in the U.S. This includes recordings done through Zoom. If you have privacy concerns about your data, provide only your first name when you join a session.
- The system is configured in a way that all participants are automatically notified when a session is being recorded. In other words, a session cannot be recorded without you knowing about it.

Course Summary

Instructor

Karen Bernhardt-Walther, Assistant Professor of Economics (teaching stream)

Contact

Email: bkaren@yorku.ca

Time and Location

This course runs asynchronously on Moodle and ALEKS. The course-week starts on Thursday. Most assignments are posted on Thursday and are due the next Wednesday.

Office hours: Mo 3-4pm on Zoom.
Meeting ID: 927 6100 3115, Passcode: 20201530

I enjoy discussing economics/ life/ college … with you and look forward to seeing you in office hours!

Course Structure

Part 0:   Introduction
Part I: Pre-Calculus Algebra.
Part II: Differentiation.
Part III: Applications of
            Differentiation.
Part IV: Integration.

Marking Scheme

Participation: 4 x 10   40
Mastery: 4 x 15   60
Bonus (week 1, infographics)   5 x 2   10

Total: 100

Class Format

The class runs asynchronously. Weekly activities support your learning through reading, writing, reflecting, watching videos, solving practice problems and debating material with your classmates.

Our learning community engages in respectful, friendly, constructive, and supportive exchanges.

Make sure to schedule time to work on this course on at least 3-4 days each week.

Key Dates

Sep 10th   Start of first course-week

Oct 3rd   Term test 1
Oct 6th   Term test 1 (alternative)

Nov 6th   Last day to drop course

Nov 7th   Term test 2

Nov 28th   Term test 3

Dec 9-23rd Final Exam Period

Course Website: Moodle

On Moodle you will find group discussions, practice tests, assignments, guidelines, etc. Check the Moodle website regularly and read announcements carefully.