Math 1560 Course Outline

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Summary

As you embark upon your study of calculus in this course (Math 1560), you likely have many questions, such as: "What is Calculus, anyway?" and "Is this on the test?" This outline will attempt to answer your questions, along with many others you did not think to ask.

1 Welcome

Welcome to Math 1560, Calculus I. And welcome to the University of Lethbridge, for those of you just beginning your university career. I am pleased to include the following (now official!) message of welcome:

> Oki, and welcome to the University of Lethbridge. Our University's Blackfoot name is Iniskim, meaning Sacred Buffalo Stone. The University of Lethbridge acknowledges and deeply appreciates the Siksikaitsitapii peoples' connection to their traditional territory. We, as people living and benefiting from Blackfoot Confederacy traditional territory, honour the traditions of people who have cared for this land since time immemorial. We recognize the diverse population of Aboriginal peoples who attend the University of Lethbridge and the contributions these Aboriginal peoples have made in shaping and strengthening the University community in the past, present, and in the future.

1.1 Course staff

My name is Sean Fitzpatrick. You'll see me twice each week in class (right?), and I also handle most of the day-to-day organization. For any questions that you don't find answered in this outline, [1] you can email me at sean.fitzpatrick@uleth.ca, or drop by my office: C540 in University Hall.

Sean's office hours are Monday from 1 – 3 pm, and Wednesday from 9 – 11 am. (These are open drop-in hours.) If those times don't work for you, please email for an appointment. Usually I have time on Friday, but due to meetings scheduled at irregular times, I'm not able to set a fixed hour.

You will also meet once each week for a **tutorial**. Your tutorial instructor will depend on your section.

Sections 1 through 6 are taught by Arie Bomhof. He can be reached via email at a.bomhof@uleth.ca.

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[1] Except questions about homework – there's a forum for that.

1.2 Basic course information

Course website: via [Moodle](#)

Course textbook: a free, custom, **Open Education Resource**.

New for 2019: I spent most of the summer working with several other people to convert the code used to generate the PDF version of our textbook into an XML language [2] that allows us to generate an interactive HTML version. The HTML version should look much better than the PDF if you're viewing it on a phone or tablet. It also includes features like embedded videos and interactive exercises.

There will be a PDF copy of the textbook available on Moodle, and you can also find it in the [OER Textbooks](#) section of my website.

Class schedule: there are two sections of Math 1560.

Math 1560A Tuesday and Thursday, 10:50 am – 12:05 pm in PE275.

Math 1560B Tuesay and Thursday, 1:40 pm – 2:55 pm in SA6008.

(Once upon a time, both sections were scheduled to meet in our new Science building. Then enrolment went way up and we had to move to a bigger room.)

Tutorials: see Moodle or your class timetable for details. There are ***no tutorials*** in the first week of class.

Office hours (Sean): Monday 1–3 pm and Wednesday 9–11 am. A complete list of office hours for all course staff will be posted on Moodle.

Grading: weighting of individual course components is given in [Table 2.2](#). Conversion to letter grades is given in [Table 2.3](#).

2 Frequently asked questions

2.1 Organizational questions

Questions related to the general operation of the course.

2.1.1   Can I get a print copy of the textbook?

Yes. I recommend using the Print-on-Demand service from the Campus Bookstore. They will print and bind copy of the book for you. It usually takes no more than a day to get a print copy from the Bookstore.

You can also print it yourself. The open license for our textbook means that you are free to do whatever you want with your electronic copy, and this includes printing it.

2.1.2   What does a typical lecture look like?

Generally we'll try to avoid a full 75 minutes of lecture, and leave time for hands-on work. This means that you should *not* expect to see every bit of course content presented in detail during class. Instead, you'll be responsible for reviewing content, using the textbook, or videos (or both), prior to class. At the start of class, I might do some informal polling to see how well everyone

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[2]Called [PreTeXt](#) — it's also the language used to make this outline!

did at preparing, and you'll have a chance to ask questions about content you struggled with.

I'll go over some main highlights of the content for the day, and do a few examples. After that, you'll have an opportunity to try some problems yourself. Most days you can expect pencil and paper work, occasionally we might work with computers as well.

2.1.3 What do we do in the tutorials?

Each tutorial will involve an in-class assignment, which you will complete and submit for feedback. Everyone has to submit their own assignment, but collaboration is allowed, and you can ask for help from the tutorial instructor. The point of the tutorial assignments is to give you an opportunity for guided practice in a smaller class (tutorials are set at 30 students each), and to get feedback on your writing in a low-stakes environment, so you know what's expected on the tests.

2.1.4 How do I find you if I need help with something?

My office is C540, in University Hall. Arie Bomhof is down the hall, in C510.

Office hours will be available on Moodle and maybe even on our office doors.

2.1.5 Do I need to make an appointment for office hours? What if I have class at that time?

You don't need an appointment -- just drop in. **Office hours** are the times that I promise to be available for consultation. If the times I choose don't work, you can email me for an appointment.

2.1.6 What if my question is not related to the course?

Come see me anyway, or send an email. If I can't help you myself, I'll try to direct you to someone who can. There's also some great general advice for first year students on the U of L website. You might be able to find an answer there.

2.1.7 OK, but what if it's kind of personal?

If it affects your ability to participate in the course (or even if it doesn't), you can come talk to me. In many cases, you might be best off seeing Academic Advising or Counselling Services. Links to these services, and general advice, can be found on the U of L website.

You may also want to visit the University's Health and Safety website for information on other resources on campus.

2.1.8 What do we learn in Math 1560?

We'll be dealing with all your favourite functions from high school: polynomials, logarithms, exponentials, trig functions, etc.while learning about limits, derivatives, and integrals.

- **Limits** tell us about the value of a function near a point. A limit is simultaneously approximate and precise. In fact, most of calculus could be described as "the art of precise approximation".

- **Derivatives** tell us about how a function is *changing* near a point. Most rates of change in the sciences, from speed to population growth, are quantified using derivatives.

- **Integrals** will be defined in the context of calculating area, but they also appear whenever aggregates or averages are being considered.

Both derivatives and integrals are defined using limits, and the two are related in a (possibly) surprising way.

2.1.9   I'm fairly sure I won't need calculus in my other courses. What should I expect to get out of this course?

To be fair, most of the learning outcomes are tied to the material, but there are some fringe benefits.

1. If this is your first semester, you'll learn how to organize your time.

2. You'll learn how to *write.* Really. Technical writing is a skill that must be learned. Solving a mathematical problem, and knowing how to communicate your results, are two different skills. You'll learn to do both in this course.

3. You'll also learn how to read and digest technical material.

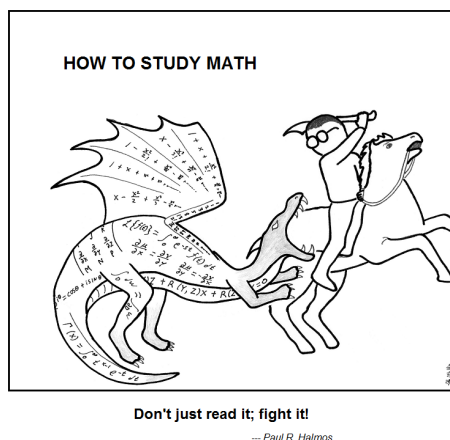*Hint:* you can't read your textbook like a novel -- it's a hands-on experience.

Figure 2.1 *Warrior,* from Abstruse Goose.

2.2 Coursework and evaluation

2.2.1   What kind of work am I going to have to do in this course?

Like any course, you'll be expected to devote time each week to learning content. In addition to the textbook, there will videos for each topic. I'll post the videos on YouTube and link to them on Moodle. You'll be expected to arrive in class having read the book, or watched the videos, or both.

2.2.2 What are your expectations of students?

- I expect you to make your best effort to arrive prepared for each class. I'm also aware that this is not always possible.

- I expect quality writing: complete sentences, proper use of notation, and clear exposition. I don't expect this right away, but I do expect you to work at improving.

- I expect you to treat your classmates with respect, and to contribute to group activities to the best of your ability.

- I expect you to ask for help when you need it. (Everyone does at some point.)

2.2.3 How will I know which part of the book to read, or which videos to watch?

Every week on Moodle I'll provide an outline of what we're covering in class, and what resources you should be accessing.

2.2.4 Thanks, but what I really meant is, how do I earn my grade?

Oh, right. The most frequently asked question of all. There are several different evaluation components that contribute to your grade:

Table 2.2 Relative weights of graded activities for Math 1560

Component	Number	Total Weight
Online homework	12	10
Tutorial assignments	11	20
Chapter tests	5	40
Final exam	1	30

2.2.5 What is involved with each of the graded components?

Here are brief descriptions of each one:

Online homework We use the **WeBWorK** online homework system. A new problem set will be posted each week. The system gives you immediate feedback on your answer, and you usually have unlimited attempts to get it right.

The main point of the online homework is for you to get *practice*. Yes, you can probably find dishonest means of completing the assignments, but then you're likely to fail the tests.

Tutorial assignments In each tutorial, you'll receive a set of problems to complete. These problems must be submitted for feedback at the end of tutorial. The grading policy is as follows:

- If our graders can find nothing wrong with your work, you'll receive full credit for that tutorial.

- If there are mistakes in your math, or in your presentation, you'll receive half credit for that tutorial.

- If you don't receive full credit the first time, you can submit corrections to improve your grade. You can make corrections in person, during office hours, by simply explaining what you did wrong. You can also attach corrections and resubmit during your next tutorial.

  Note: corrections will typically be due within two weeks of your tutorial, unless our graders are delayed in returning your work to you. Corrections for the second-last tutorial must be done during office hours prior to the final exam. Due to grading logistics, your final tutorial will be graded based solely on attendance.

- There are 11 tutorials, and your best 10 count for your grade. A missed tutorial counts as a grade of zero, unless it's an excused absence. See Subsection 2.3 for details.

Tests There will be five tests — one for each chapter of the textbook. (See Section 4 for test dates.) The tests will be *two-stage* tests. Stage one is an individual test, consisting of both multiple-choice conceptual quesitons, and written-answer (long form) questions.

Stage two is done in groups, and consists only of the multiple-choice portion.

Final Exam A traditional, cumulative, three-hour exam. Note that final exams are no longer scheduled according to the timetable, so the date of the final exam will not be known until sometime in October. You should plan to remain on campus for the entire exam period. The Registrar's Office *will not* allow you to reschedule due to travel conflicts.

2.2.6 How do I access the online homework?

You will log in directly from Moodle. As long as you have access to a computer and an internet connection, you have access to WeBWorK. Note that authentication is handled by Moodle, rather than a username/password combination.

2.2.7 Two-stage tests? How does that work?

The group stage allows for immediate peer feedback on the results of the test. The tests are meant to be a *learning* opportunity, not simply a grading obstacle.

Each test is worth 10% of your grade: either 8% individual, plus 2% group, or 10% individual, whichever is better.

2.2.8 Wait, does that mean I can just skip the group stage and take my individual score?

Technically, yes. But I don't recommend it. It's very rare that a student's group score is less, and the group discussion helps to ensure you've nailed down all the concepts, even if you think you got it all right the first time.

2.2.9 How does regrading work for tutorials?

The point of allowing resubmission is to encourage you to learn from your feedback. Experience tells me that if we give a numerical score, many of you won't bother to figure out what you did wrong.

When we grade your corrections, we'll be looking for evidence that you made an honest effort to figure out where you went wrong and improve.

2.2.10   How are letter grades calculated?

Each of the grade components above will be assigned a numerical score. These will be added to get a score out of 100 using Table 2.2. Your score out of 100 is converted into a letter grade according to the following table.

Table 2.3 Conversion of percentage scores to letter grades in Math 1560

A+	A	A-	B+	B	B-	C+	C	C-	D+	D	F
97-100	91-96	87-90	83-86	78-82	74-77	70-73	64-69	60-63	56-59	50-55	0-49

2.3 Course policies

This section deals with questions about accommodations, missed tests, and other exceptional (yet common) cases.

2.3.1   One of the tests conflicts with something else in my schedule. What are my options?

If you know in advance that you will not be able to attend a test due to an "approved absence", like varsity athletics, a conference, tea with the Queen, etc., send me an email. We will try to arrange an alternate sitting of the test. (Individual stage only.)

2.3.2   I missed a test! What do I do? Do I get a zero?

First, contact me as soon as possible for any missed test. There are *five* tests, and I only count *four* towards your grade. As long as you only miss one test, there is no penalty. This is true regardless of your reason for missing the test.

2.3.3   What if I really wanted to write that test?

Inform me of this when you contact me to explain your absence. There's no guarantee that I can schedule a makeup test, but I'll try. You're more likely to get a makeup test if you've contacted me in advance.

2.3.4   Do I need a doctor's note?

No. This wastes health care resources and your time. Just email me to say you were sick. However, if you miss more than one test due to illness, we'll need to meet to discuss how to adjust your grade.

2.3.5   What if my car breaks down?

Same thing, for this, or other circumstances beyond your control. Send me an email, and we'll sort something out. But if there's a snowstorm forecast for the night before, maybe don't plan a trip to Calgary.

2.3.6   I'm on one of the Pronghorns teams.

Good for you!

Oh, you probably have some scheduling issues. Your coach should be providing you with a letter. Plan to meet with me during office hours one day and we'll sort something out.

2.3.7 I receive learning accommodations. What arrangements can I make?

First, make sure that you have registered with the University's Accommodated Learning Centre. If you have exam accommodations, you'll need to schedule your exams with them. No need to let me know: they'll contact me to request a copy of your exam.

If you require any in-class accommodations, or if there are any adjustments I can make to facilitate your learning, please do not hesitate to get in touch with me. All students deserve an equal opportunity to learn.

2.3.8 I write my tests with Accommodated Exams. How do I participate in the group stage?

Make sure to meet with me early in the semester, and we'll figure out what works for you. In the past, some students have chosen to write the individual stage with Accommodated Exams, and then join the class prior to the group state. Others chose to write both stages with the class.

2.3.9 Do we get to have calculators for the tests?

I guess... Officially, you're only supposed to use a "basic calculator" — one that can add, subtract, multiply, and divide. Graphing calculators are definitely not allowed. Note that decmial approximations are rarely preferred over exact values. Questions are usually designed so that no calculator is needed. Try not to rely on yours.

2.3.10 Life intervened and I can't keep up this week. What do I do?

Send me an email. Extensions are usually granted as long as they're granted ahead of time. Online homework extensions need to be in place before solutions become available. See me if you're having trouble, or take a look at the other resources mentioned in Question 2.1.7.

2.3.11 I missed class. What do I do?

If it's a one-time thing, don't worry about it. Drop by during office hours if you need to catch up. If circumstances are conspiring to keep you from class on a regular basis, please meet with me to come up with a plan to get you through the course.

2.3.12 Is there anything else I need to know?

Students are expected to abide by the policies and regulations as laid out in the Academic Calendar. This includes the University's policies on plagiarism and academic misconduct. In Math 1560, this more or less amounts to not copying on the tests, and not getting someone else (including a website) to do your homework for you.

2.3.13 I have a question that isn't answered here. How do I contact you?

Short answer: you can send me an email. There are a few caveats, however:

- First, check the course page (and the announcements forum) on Moodle. Any information I need to communicate to the class will be posted on Moodle, or emailed to the class as an announcement via Moodle.

- Is the question about homework? Email is not a good medium for discussing math. Your best option is to ask me in person. If that doesn't work, we have a class discussion forum, on Piazza.com. You'll be able to access the forum via Moodle.

2.3.14 I sent you an email. Why haven't you answered it yet?

Here's a short troubleshooting guide:

- Your email was not sent from a ULeth account and had no subject line: It went to my spam folder.

- Your email sent between 10 pm and 6 am: I'm asleep. I'll answer when I get to work in the morning.

- Your email sent during office hours: I'm busy helping the students who are here in person. Consider dropping by yourself.

- Your email asked for help on a specific homework problem: Direct your question to the online forum.

- Your email was about something already addressed in this FAQ, and I need time to come up with a polite reply.

3 Learning outcomes for Math 1560

This page outlines the list of competencies each student is expected to achieve in Math 1560. There are five "big themes," corresponding to the five chapters of the textbook. (The number following each outcome below indicates the corresponding textbook section.) The online homework, tutorial assignments, and tests are all designed to help you achieve these outcomes.

Note: this list of learning outcomes should also serve as your outline for the final exam. The exam might not be able to test *all* outcomes, but all outcomes are potentially on the exam.

By the end of the course, you should be able to:

Chapter 1: Limits and continuity

1) Explain the concept of a limit using graphical and numerical information. (1.1)

2) Apply limit laws in an abstract setting (explicit functions not given). (1.3)

3) Use algebraic manipulation to evaluate limits. (1.3)

4) Evaluate limits involving trigonometric functions. (1.3)

5) Algebraically and graphically determine one-sided limits of piecewise-defined functions. (1.4)

6) Evaluate limits involving infinity and determine asymptotic behaviour of a function. (1.5)

7) Demonstrate continuity of a function using the definition. (1.6)

8) Understand and apply the **Intermediate Value Theorem**. (1.6)

Chapter 2: Derivatives

1) Understand and apply the limit definition of the derivative. (2.1)

2) Understand and apply basic derivative rules (sum, constant, power). (2.3)

3) Calculate derivatives using the product rule. (2.4)

4) Calculate derivatives using the quotient rule. (2.4)

5) Calculate derivatives using the chain rule. (2.5)

6) Use implicit differentiation to compute the equation of a tangent line. (2.6)

7) Compute derivatives using logarithmic differentiation. (2.6)

8) Compute derivatives of trigonometric and inverse trigonometric functions. (2.7)

Chapter 3: Graphical behaviour of functions

1) Determine maximum and minimum values of a continuous function on a closed interval. (3.1)

2) State the **Mean Value Theorem** and apply it to theoretical problems. (3.2)

3) Determine intervals on which a function is increasing/decreasing, and classify critical points. (3.3)

4) Use the second derivative to determine concavity, and understand its significance. (3.4)

5) Produce an accurate sketch of the graph of a function without the use of technology. (3.5)

Chapter 4: Applications of the derivative

1) Solve word problems involving related rates of change. (4.2)

2) Solve word problems involving optimization. (4.3)

3) Use linear approximations to estimate function values. (4.4)

4) Compute the Taylor polynomial of a function to a specified degree. (4.5)

Chapter 5: Integration

1) Compute antiderivatives and solve initial value problems. (5.1)

2) Understand and apply properties of definite integrals. (5.2)

3) Use a left- or right-endpoint Riemann sum to approximate area under a curve. (5.3)

4) Calculate a definite integral using the Riemann sum definition. (5.3)

5) Use Part I of the FTC to compute derivatives of functions defined as integrals. (5.4)

6) Use Part II of the FTC to evaluate simple definite integrals. (5.4)

7) Use the method of substitution to evaluate definite and indefinite integrals. (5.5)

8) Set up and evaluate a definite integral to compute area between curves. (5.6)

4 Course schedule

I will do my best to stick to the following course schedule. Test dates are fixed, but outcomes available for in class work may vary slightly. Up to date information will be maintained on Moodle.

Table 4.1 Math 1560 topics schedule for Fall 2019

Thursday, September 5	Syllabus, Section 1.1
Tuesday, September 10	Section 1.3
Thursday, September 12	Sections 1.4 and 1.5
Tuesday, September 17	Section 1.6
Thursday, September 19	Section 2.1
Tuesday, September 24	Test #1
Thursday, September 26	Sections 2.3 and 2.4
Tuesday, October 1	Sections 2.5 and 2.6
Thursday, October 3	Section 2.7
Tuesday, October 8	Sections 3.1 and 3.2
Thursday, October 10	Test #2
Tuesday, October 15	Sections 3.3 and 3.4
Thursday, October 17	Section 3.5
Tuesday, October 22	Section 4.2
Thursday, October 24	Test #3
Tuesday, October 29	Section 4.3
Thursday, October 31	Sections 4.4 and 4.5
Tuesday, November 5	Sections 5.1 and 5.2
Thursday, November 7	Test #4
Tuesday, November 19	Section 5.3
Thursday, November 21	Section 5.4
Tuesday, November 27	Section 5.5
Thursday, November 29	Section 5.6
Tuesday, December 3	Test #5