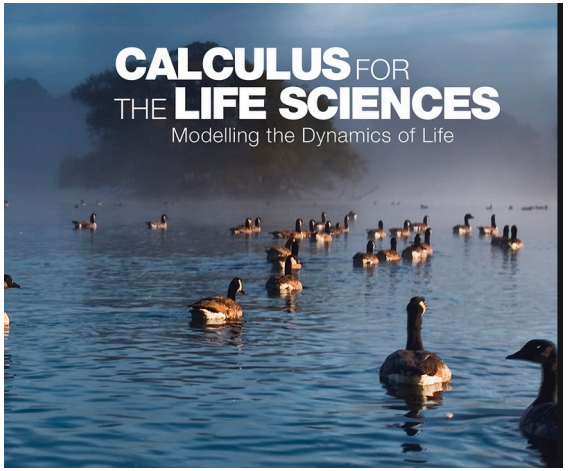
Math 1LS3

Calculus for the Life Sciences I



Instructor Information

Instructor: Erin Clements

Email: clemene@math.mcmaster.ca

Office: Hamilton Hall, room 425

Office Hours: TBA

Course Content

- standard calculus material: limit, continuity, derivative, integral
- calculus objects in context: for instance a function (abstract math object) could represent a population of bacteria (application)
- modeling: using math to study problems arising in life sciences
- approaches to math: algebraic, numeric, geometric, verbal (descriptive)

Abstract math vs math in applications

it is the same math, but …

Example: heartbeat frequency *h* (in beats per minute) of a mammal of body mass *B* (in kg)

$$h = 241B^{-1/4}$$

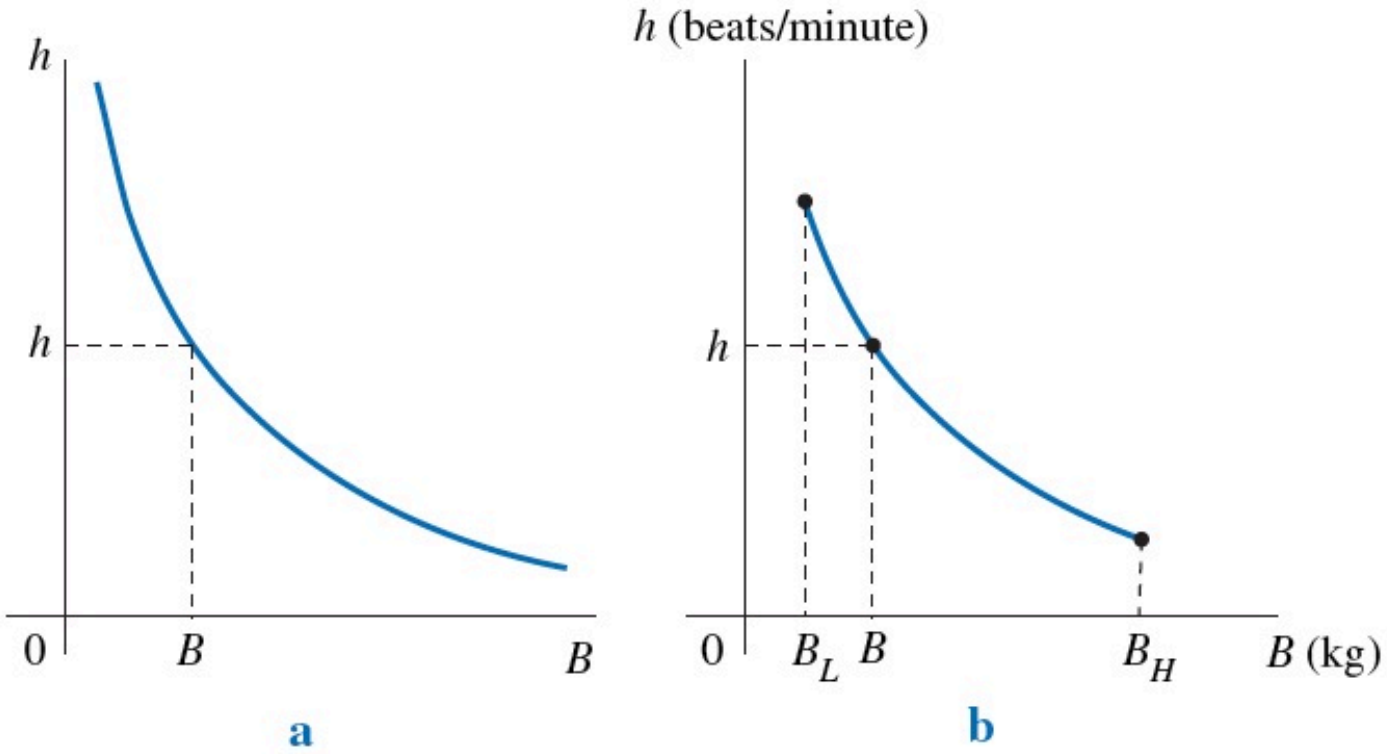
so, no longer

$$f(x) = 241x^{-1/4}$$

math symbols have a meaning

Abstract math vs math in applications

it is the same math, but …



Math: domain consists of all positive numbers

Biology: domain is an interval from the lightest to the heaviest mammal

What questions can the math taught in 1LS3 help us answer?

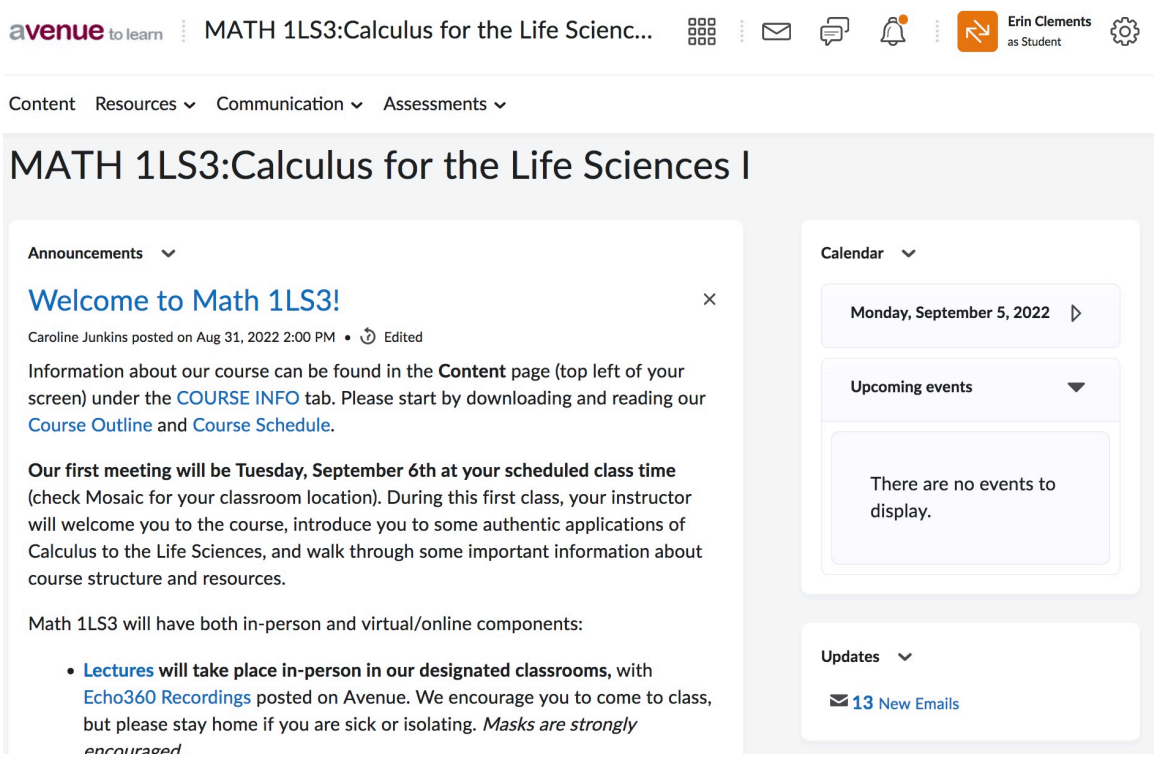
- How does our body process and eliminate drugs (Tylenol, alcohol, recreational drugs)?
- How does math help forensic pathologists find a location of impact (say from a bullet) from blood splatters?
- An x-ray shows that a blood vessel branches off the right coronary artery at an angle of 78 degrees. Is there a reason for concern?

What questions can the math taught in 1LS3 help us answer?

- How do we estimate the surface area of a lake (we need this need when we study pollutants and their effect on underwater fauna and flora)?
- How do we compute the volume of a heart chamber from a sonogram (ultrasound image)?
- How is UV index calculated?

Course Information – its all on AVENUE

Start by downloading and reading our **course outline** and **course schedule**!



Course Delivery

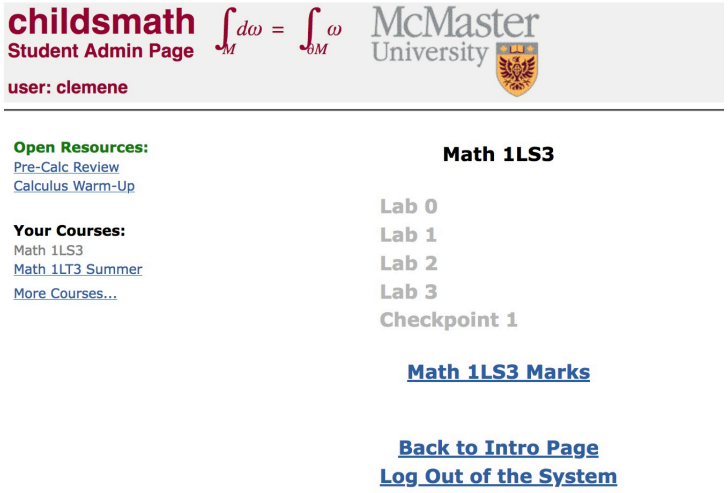
- **lectures**… scheduled to be in person (recordings are uploaded to Avenue after each lecture)
- **tutorials**… virtual (Teams and/or Zoom)… will start next week

Course Evaluation

Topics	Weight
Participation (completion of quizzes/activities)	10%
Computer Labs (collectively worth 15%)	15%
3 Term Tests (each worth 15%)	45%
Final Examination	30%

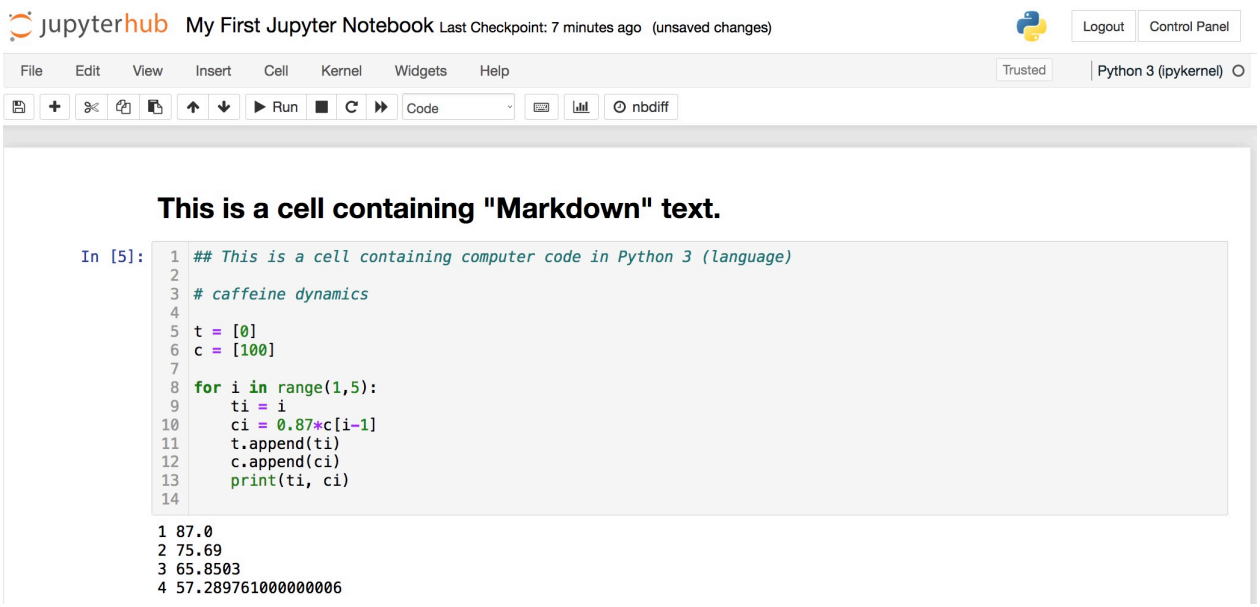
Participation (10%)

- Baseline assessment (2%)
  - One at the beginning of the semester, submitted on Crowdmark
- Checkpoints (8%)
  - Series of 10 quizzes assigned regularly throughout the semester, accessed and submitted through Childsmath



Computer Labs

- There will be 4 computer labs assigned throughout the course.
- We will use **Jupyter Hub** as our Python 3 coding environment. You can access McMaster's server here: https://mcmaster.syzygy.ca/



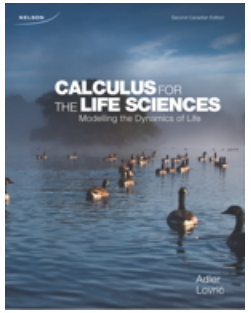
Term Tests and Final Exam

- **3 Term Tests** (15% each)… tentative dates are in course outline, detailed information (i.e., what topics are covered, where you will write the test, etc.) will be posted in Avenue closer to each test date
- **Final Exam** (30%)… in December; scheduled by the Office of the Registrar (date/time are usually posted late November)

Course Materials

- **math 1LS3 textbook (required)**
  "Calculus for the Life Sciences: Modelling the Dynamics of Life", Fredrick A. Adler, M. Lovric

(Note: The student's solution manual is optional)



- **math 1LS3 courseware (required)**

- **McMaster standard calculator – Casio fx991 (required)**

To Do

- ✓ Familiarize yourself with our Avenue page
- ✓ Read the Course Outline posted in Avenue thoroughly
- ✓ Print the Week by Week Schedule to keep with your Math 1LS3 notes

To Do

- ✓ Purchase your course materials; work on Assignment 0 in your courseware (review)
- ✓ Bookmark Childsmath; try the System Tutorial
- ✓ Bookmark Jupyter hub; if you're brand new to coding, watch this and follow along: https://www.youtube.com/watch?v=dEWsl4OUJ_c&t=1199s

To Do

✓ Download lecture outlines for this week

Math 1LS3 Lecture Outlines for Sections 02 and 03 (Clements)

* Note 1: Please note that the lecture notes posted are just an outline of the material covered in class. Details, solutions, and additional examples will be added during lectures.

* Note 2: Topics won't necessarily be covered in the order below. Please see Avenue for our Fall 2022 Calendar to see which sections will be studied each week.

intro	1.2	1.3	1.4	2.1
2.2	2.3	3.1	3.2	3.3
4.1	4.2	4.3	4.4	4.5
5.1	5.2	5.3	5.4	5.5
5.6	5.7	6.1	6.4	6.7
6.8	7.1	7.2	7.3	7.4
7.5	7.6	7.7		

https://ms.mcmaster.ca/~clemene/1LS3lectureoutlines.html

Expectations

- come to all classes… make sure your lecture notes are organized and complete
- work on practice problems regularly … an hour or so every day is more manageable than 8-10 hours straight before a test
- learn actively… study, ask questions, use math help centre
- take responsibility for your education … reflect on things, identify problems and deal with them immediately, ask for help when you need it, don't get behind (or recover quickly if you do)