5 minute Presentations

(as of 25 May 2020; will be updated as we receive further slides)

Contents of this file:

NOTES TAKEN DURING THE PRESENTATIONS (Xinli Wang)

SLIDES:
- GRADESCOPE (John Craighead)
- ONLINE PROCTORING PILOT (John Craighead)
- A MID-SEMESTER REPORT ON AN (ONLINE) WRITINGINTENSIVE LINEAR ALGENBRA COURSE (Jerrod Smith)
- OUR ONLINE EXPERIENCE WITH MOBIUS (Amanda Garcia and Burcu Karabina)
- TEACHING CALCULUS I ONLINE (Lauren DeDieu)
- DESIGNING ASSIGNMENTS AND FOSTERING COMMUNITY WHILE TEACHING MATH AND STATS REMOTELY (Ann Gagné)
- IF x=COVID-19, THEN WHAT IS x+1? (Veselin Jungic)
- ACADEMIC INTEGRITY: THE STATISTICS OF COVID-INDUCED CHEATING (Tyler Holden)

FYMSiC Online Conference: Teaching Math and Stats Courses in Interesting Times (to say the least)
Saturday, May 23rd, 2020

Session 3: 5-minute Presentations

Special Presentation
Title: Designing assessments and fostering community while teaching math
Speaker: Ann Gagne (University of Toronto Mississauga)
- Assessment strategies
  1. Instructions should have steps and points to follow; bonus points: have videos.
  2. Instructions should demonstrate course learning outcomes.
  3. Feedback: automated, video, audio etc
  4. Scaffolding: use quizzes as the foundation to move to tests;
  5. Student engagement: polls & surveys & zoom polls & canvas quizzes
  6. Active learning: case studies; student-generated test questions; student curated resources
  7. Collaborative learning: podcasts, wikis, video demos, projects
  8. Summative: wiki, test, case studies, exam, exam wrappers
  9. Scaffolded assessment example: we can ask students to create 2-minute video/audio/gif that show a certain concept
  10. Assessment and universal design: intentionality; multiple means (representation+engement+expression);

- Community building
  1. Access check: check in technology; space with students
  2. What is presence online: social; teaching; cognitive
  3. Community presence synchronously: student group feedback; office hours; break out rooms; chat; social media
  4. Classroom management: profile (photo+description); take class pulse with surveys, feedback
  5. Plan your instruction; get to know your students; lay the foundation

Q&A
- Can you talk about the captioning? Google or Microsoft. It's automatic. Ann used Google slides here.
- Does it improve overtime? Yes!
- It works in English and French. Microsoft can do translation as well.
- For the 3 types of presence: isn't it true that teaching includes social and cognitive? Ideally yes, but in an online environment we want to make sure each piece is there.

5-minute Presentations

Title: Designing a Cohort Assessment for First Year Engineering Students
Speaker: Gary Au (University of Saskatchewan)
- Motivation: several limit examples, guess where Q1 is. (a simple limit but lowest average) students are better at problems that need manipulations.
- New first-year engineering program: students need to master the basic things. Each course grade has two components: basic :at least 70% advanced:30%
- New practices: cohort assessment; students will be given tests to gauge their mastery; only basic problems are used
- Example problem: evaluate a limit base on the graph; solve linear system;

  Q&A
- How to define basic? It's arbitrary: do they really need to know it for future courses?

*****

Title: A mid-semester report on an online writing-intensive linear algebra course
Speaker: Jerrod Smith (University of Calgary)

- Use discussion boards for linear algebra.
- MAT 311: 2nd linear algebra where students learn how to write proofs.
- Setting open discussion boards to cut down emails and foster community.
- Students have their own venue to discuss things: whatsapp
- Writing assignment: introduce yourself; set goals for the course etc. Everyone posted 341 replies. Instructor also tried to reply and say hi to everyone.
- Peer evaluation exercise: students are placed in random groups, then they use the rubric to assess peer's work.
- Participation was good; students were good at identifying key points; students were not good at identifying standard notations, quantifiers, logic
- They tend to give higher scores: maybe due to the rubric; limited experience; they haven't received any feedback
- In future, instructors will offer flawed solutions and let students assess them.

Q&A

- Can you share the rubrics? Yes a few will be made available.

*****

Title: Teaching Calculus I Online
Speaker: Lauren De Dieu (University of Calgary)
- Context: first-year calculus Winter 550 students, spring 350 students
- Non-engineering students

- Flipped classroom: watch topic and do quiz; do review; then lab and webwork
- Positive: quiz pushes students to come to lectures with questions; getting emails about quiz questions
- D2L checklist outlines what needs to be done
- Timed mock midterm: it's better than posting past midterm
- Discussion board: a nice venue to ask questions
- Zoom office hours; online chats during lectures

Q&A
- Is it online course or remote teaching? It's remote teaching.

*****

Title: If x= COVID−19, then what is x+1?
Speaker: Veselin Jungic (Simon Fraser University)
- X-1 = pre COVID-19 x = COVID-19 what is x+1?
- Is there a function f s.t f(x) <0? Negative experience
- Take f=academic integrity: horror stories dealing with cheating
- Is there a function f s.t f(x)>0? Take f= experience with remote teaching, we learn more about ourselves and what's out there for remote teaching
- If f is a reasonable function, then f(x) neq 0.
- Nothing stays the same after all these experiences. What's x+1?
- A polling question: it's undefined.
- A personal take: part of instruction is face-to-face; at the same time remote part of the teaching will remain in the picture. Blended learning will be there after this is all over.
- Large classes vs small classes question will go away.

Q&A
- What's reasonable? Non-empty set of math instructors who think it's reasonable.

*****

Title: Teaching a large analysis course
Speaker: Yvan Saint-Aubin (Universite de Montreal)
- New challenge: not teaching, not assisting students, but how to help newcomers to find their scientific mates?
- It's compulsory for math majors, double majors math-phys, math-computer science, math eco etc
- Worse success rate
- Team learning is essential: how to make friends with zoom?
- Ideas are welcome
- Newcomes will register, but will they stay in the course? The lack of teamwork, human interactions -> drop out?

- A real get-together in Sep?
- Forum activated in moodle
- Small assignments done in teams? But where to find TAs?

Q&A
- Piazza (from Alfonso & Gary) forum is great. Calculus course students use it and allow students to search for teammates. It also supports Tex.
- Is it real analysis from a calculus perspective (from Brian)? Yes. It can be done but how to generate discussions is a challenge.

*****

Title: My experience with Gradescope
Speaker: John Craighead (Memorial University)
- Marking journey: manual grading -> D2L grader -> Crowdmark -> gradeScope
- Grouping by common solutions/questions/code marking are possible in GS
- The amount of work to set up is not trivial in GS
- AI marking in GS; amount of marking is less in GS
- Marking quality is very good in GS
- AI grouping by similar solutions in GS: the entire group can be marked at one go
- TAs and Instructors need to make sure each group's solutions are homogeneous
- Markers need to do a good job in identifying whether a group is homogeneous
- Grading rubrics can be posted, changed, retroactively
- Regrading requests can be done.

Q&A
- How much is it? GS is $5 per student vs CM $3 per student
- How do you find tech support in GS? It's excellent.

*****

Title: What I love about teaching online
Speaker: Ilona Kletskin (Ontario Tech University)
- You can teach in pajamas!
- I have more people participating in chat.
- I'm able to use TA hours from invigilation to attend lectures and answer questions in chat.
- Less formal so students' mood is lighter.
- Fall semester i will try harder to improve engagement: breakout rooms; ice-breaker activities etc.
- Assessment: we use LMS: Speedgrader option is great! It's easy to add text/audio comments. No downloading file is necessary.

Q&A
- Turnitin? We already have it; but we won't use it because we have speedgrader.
- Chat function in Zoom is great (from Andie)! Students like the chat function; asking professor questions is easier in chat. It's a little distracting though. So the help from TAs helps.

*****

Title: Academic integrity - Some statistics
Speaker: Tyler Holden (University of Toronto Mississauga)
- Context: 14 500 students at UTM; program of study: commerce/econ/CS are competitive; 1 in 3 chance to get in for students. Toxic and great temptation to cheat.
- Three levels of integrity committee
- Statistics:percentage of sanctioned only 4% for 2018-2019
- Math final exam April 2020: 1 person does all the work per class; 30 minutes per student; only work on cases with sure convictions; the workload can get heavy for a big course
- The stats show the lower bound only;
- First year math course final exams: 210 cases
- Interpretation?
- 500 Chegg posts related to math final exams;

Q&A
- Weightage? It depends. Syllabi changes need to be approved.
- Most common way of cheating? Chegg. Few impersonations but hard to gather evidence.
- Why isn't Chegg being sued for copyright infringement? It's the responsibility of the uploader: it's the student's fault. Chegg will work with universities.
- What's the proportion of cases that are probably cheating but not flagged out. Tyler's guess is 50% but only 25% are submitted.

*****

Title: On-line Proctoring Options - effective and affordable
Speakers: John Craighead (Memorial University) and Geoff Rideout (Memorial University)
- The system needs all university approved softwares.
- Everything is inside D2L; Webex is live proctoring
- Preparation -> check in -> Testing

Q&A
- Do you have privacy issues? It's been approved.
- Students hold ID cards for now, but proctors will have access to the students database or students upload IDs.

*****

Title: Building courseware with Mobius

Speakers: Amanda Garcia (University of Waterloo) and Burcu Karabina (University of Waterloo)

- Mobius is a platform for creating and deploying online STEM courses
- Course design philosophy: active learning/metacognition
- A demo lesson is shared: interactive slides show; videos; problems with feedback; Geogebra
- Response types : stop and think; fill in the blank; MCQ etc
- In each unit, there is a section that gradually increases student's independence
- Application section highlights applications of a certain topic
- Practice problems are available; partial solutions are available
- Algorithmic questions are randomized; can be chosen from a pool
- Data is available
- Student feedback is positive

Q&A

- How much is it? Not sure.
- What's the advantage? Did you make up your own questions? We made most of the questions; there is a Mobius question expert on campus; Mobius accepts two equivalent math expressions while others fail to do so. Creating proof-like questions is possible.

My Experience with Gradescope
John Craighead, Lecturer, Math & Stats Dept., MUN

FMYSiC On-line Conference   May 23, 2020
Teaching First Year Courses in Interesting Times
(. . . to say the least !)

MARKING JOURNEY
(Classes of 100 - 300)

2012-2015 Grind: Manual Grading & Flows

2016-2017 D2L Grader
Fully Electronic Grading & Flows (no grouping)

2018 Crowdmark Pilot
Fully E-Grading & Flows with:
- grouping by question

2018 Gradescope Pilot
Fully E-Grading & Flows with:
-   grouping by question
-   grouping by common sol`ns
-   regrade functionality
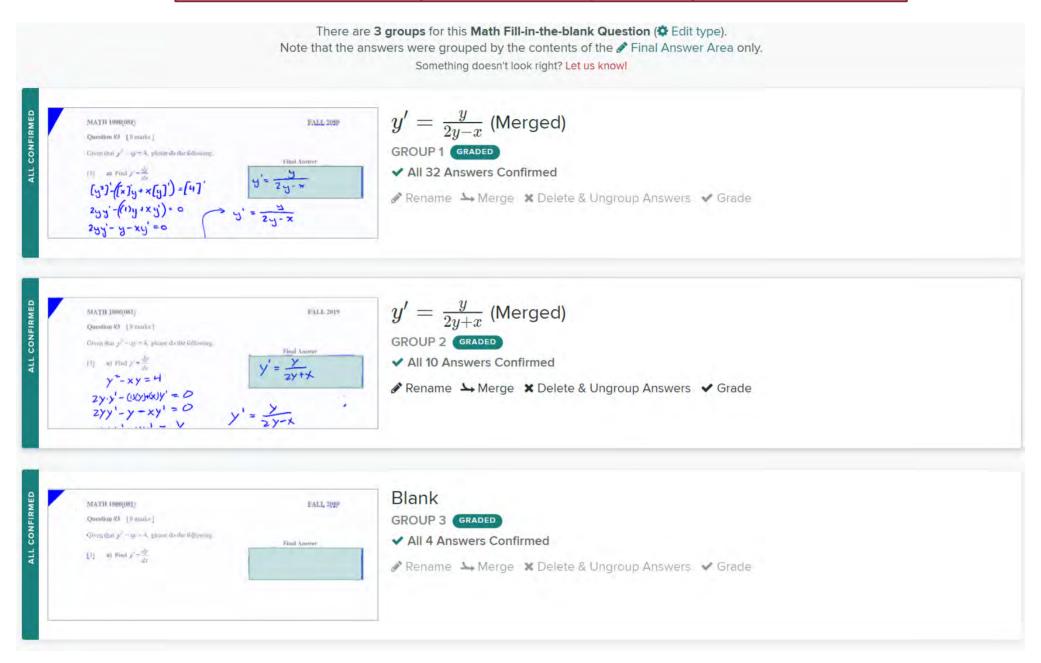-   code marking & auditing

Gradescope
(ongoing)

COMPARISONS

Platform	Electronic Start to End	Grouping by Question #	Grouping by Solutions	Regrade Option	+ Code audit & marking
D2L Grader	Y	N	N	N	N
Crowdmark	Y	Y	N	N	N
Gradescope	Y	Y	Y	Y	Y

Platform	Work to Set-Up w/o AI	w. AI	Work for Student Free-form	Formatted	Work for Marker w/o AI	w. AI	Marker Role w/o AI	w. AI
D2L Grader	Easy	n/a	n/a	n/a	less	n/a	Traditional + (comments)	n/a
Crowdmark	Easy	n/a	Easy	Easy	Less	n/a	Traditional + (comments)	n/a
Gradescope	More	MORE	More	more	Less	LESS	Traditional ++ (comments, regrades)	Traditional +++ (comments, regrades, GRPING)
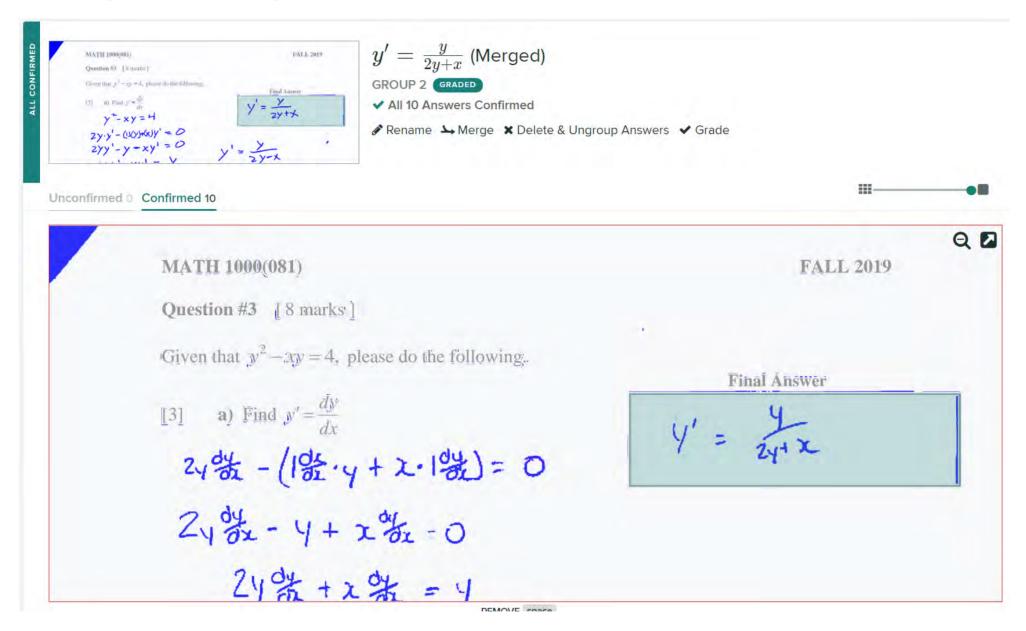
Platform	Marking Quality w/o AI	w. AI	Marker Satisfaction w/o AI	w. AI	Student Satisfaction As Is	w. Regrade
D2L Grader	Ok	n/a	n/a	n/a	Ok	n/a
Crowdmark	Good	n/a ?	Good	n/a ?	Good	n/a ?
Gradescope	Better if good rubrics	BETTER if good rubrics & grouping	Better faster & more time to comment	BETTER faster & more time to comment	Better faster return, more feedback	BETTER faster return, more feedback, REGRADES

MEMORIAL UNIVERSITY

AI Grouping by Similar Solutions
(within each question)

There are **3 groups** for this **Math Fill-in-the-blank Question** (⚙ Edit type).
Note that the answers were grouped by the contents of the ✏ Final Answer Area only.
Something doesn't look right? Let us know!

ALL CONFIRMED

$$y' = \frac{y}{2y-x} \text{ (Merged)}$$

GROUP 1 GRADED

✔ All 32 Answers Confirmed

✏ Rename ↳ Merge ✖ Delete & Ungroup Answers ✔ Grade

ALL CONFIRMED

$$y' = \frac{y}{2y+x} \text{ (Merged)}$$

GROUP 2 GRADED

✔ All 10 Answers Confirmed

✏ Rename ↳ Merge ✖ Delete & Ungroup Answers ✔ Grade

ALL CONFIRMED

Blank

GROUP 3 GRADED

✔ All 4 Answers Confirmed

✏ Rename ↳ Merge ✖ Delete & Ungroup Answers ✔ Grade

MEMORIAL UNIVERSITY

Looking inside one group . . .

MATH 1000(081)   FALL 2019

Question #3 [8 marks]

Given that $y^2 - xy = 4$, please do the following:

[3]   a) Find $y' = \frac{dy}{dx}$

$y^2 - xy = 4$

$2y \cdot y' - (1 \cdot y + x \cdot 1)y' = 0$

$2yy' - y - xy' = 0$

Final Answer

$y' = \frac{y}{2y+x}$

$y' = \frac{y}{2y-x}$

$y' = \frac{y}{2y+x}$ **(Merged)**

GROUP 2 GRADED

✔ All 10 Answers Confirmed

✏ Rename ↳ Merge ✖ Delete & Ungroup Answers ✔ Grade

Unconfirmed 0   Confirmed 10

MATH 1000(081)   FALL 2019

Question #3 [8 marks]

Given that $y^2 - xy = 4$, please do the following:

[3]   a) Find $y' = \frac{dy}{dx}$

$$2y\frac{dy}{dx} - \left(1\frac{dy}{dx}\cdot y + x\cdot 1\frac{dy}{dx}\right) = 0$$

$$2y\frac{dy}{dx} - y + x\frac{dy}{dx} = 0$$

$$2y\frac{dy}{dx} + x\frac{dy}{dx} = y$$

Final Answer

$$y' = \frac{y}{2y+x}$$

REMOVE space

. . . Once all groups refined/approved, entire group marked/commented like a single assignment. Improves quality of my test/exam grading, also reduces grading time by 1/3 !

TOTAL POINTS

4.0 / 4.0 pts

⚙ Rubric Settings

Collapse View

| 1 | +0.0 |
| Blank/Wrong |

| 2 | +4.0 |
| Completely Correct |

| 3 | +0.5 |
| Direct Sub.: 0/0 |

| 4 | +1.0 |

$$= \lim_{x \to -2} \frac{(x+2)(x-4)}{(x+2)(x+3)}$$

| 5 | +1.0 |

$$= \lim_{x \to -2} \frac{x-4}{x+3}$$

| 6 | +1.0 |

$$= \frac{-2-4}{-2+3}$$

TOTAL POINTS

ⓒ Regrade Requests

Previous Requests

Student Request
I'm wondering how I got this question wrong as the x is how we showed this on the assignment?

Staff Response (edit)
Emile: I used an X on assignment trying to simplify things. The best naswer is DNE as nothing to right of +inf. This said, I've given you back 1 point here.

Student Request
Also just wondering if I could get an explanation of the last part as we did not need to know f(+inf) on the assignment but it seems like the answer would be +inf. Thanks.

Staff Response (edit)
f(+inf) DNE as +inf isn't a number, it's a concept. You can approach +inf but never get there.

MEMORIAL
UNIVERSITY

- Used by Scientific Computing (inter-dept.) -and- Computer Engineering (Engi.)

- Both code auditing (plagiarism) & auto-grading (using instructor`s rules)

- Scientific Computing folks say following important: " Gradescope uses a unit testing approach to establish code correctness."

- For more information:
  - Visit: https://gradescope-autograders.readthedocs.io/en/latest/getting_started/
  - Contact: Jonathan Anderson (MUN Engineering) jonathan.anderson@mun.ca
    Scott MacLachlan (MUN Scientific Computing) smaclachlan@mun.ca

Thanks for listening (!), any questions ?

On-line Proctoring Pilot - 2020SP Term
MUN Math & Stats -and- Engineering
System developed by U. of Delaware Engineering

John Craighead, Lecturer, MUN Math
Geoff Rideout, Professor (ME) & Director First Year Engineering

FMYSiC On-line Conference   May 23, 2020
Teaching First Year Courses in Interesting Times (. . . to say the least !)

CONTEXT

System developed & deployed by U. of Delaware, College of Engineering
(Profs Suresh Advani - concept, Jenni Buckley - scaling/training, Louise Bank - coordination)

Successful large deployment for 2020W by U. of Delaware, no major glitches

Brought to MUN by Geoff Rideout, Prof. (ME) & Director of First Year Engineering,
supported by Deans of Sci. -and- Engi., Dept. Heads, CITL Director & Staff, & others

MUN 2020SP Pilot

Campuses: St. John`s & Grenfell campuses

Math & Stats: 8 courses, 850 students (45-135 / course)

Engineering: 2 courses, 140 students (40-100 / course

Tests (3-4/course): 1 Practice, 1-2 Midterms, 1 Final Exam

Proctors: TAs, Ratio 15/1

Funding: MUN SSF Grant, Dept. TA funding

MEMORIAL
UNIVERSITY

SYSTEM

Software

- Using university approved software (important !)
- Test inside D2L (our LMS) proctored by Webex (a secure Zoom)
- D2L: Student info, their work & test itself stay inside D2L ,
  secured by LockDown Browser
- Webex: No recording, just live proctoring
           Accessed via D2L (i.e. one stop shopping !)

Functionalities

- Instructor hosts simultaneous exam meetings, proctors as presenters
- D2L: LockDown Browser activated to isolate student & test
- Webex, Student: chat (except with Proctor) & mic disabled
- Webex, Proctors: mic, general chat & private chat all active

MEMORIAL
UNIVERSITY

STEPS

```
Preparation  →  Check-In  →  Testing  →  Check-out
```

Preparation (well ahead)
- Student info video
- Student tests internet (speed, stability, etc.)
- Proctor training
- Live Practice Test, students & proctors

Check-In
- Students enter Waiting Room
- Proctor ids, checks surfaces, & ensures student in required exam position
- Student accepts academic integrity pledge
- Proctor admits to test room
- If bad IT, student moved to IT room to fix or reschedule

Testing
- Students open test in D2L (multiple choice quiz or long hand)
- Students do test, proctored by TA
- Instructor in session as TA resource
- If connection lost, student rejoins (if < 5 min.) or rescheduled (if > 5 min.)
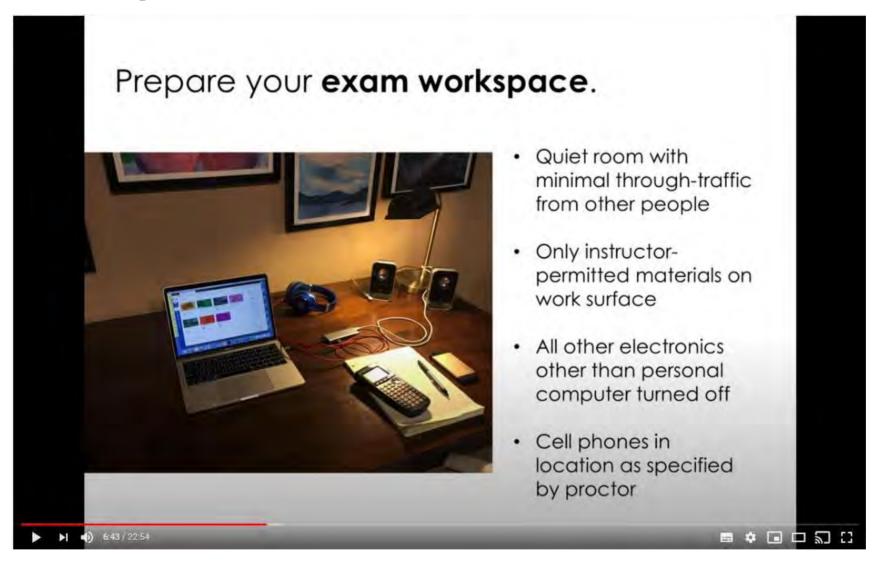
Check-out
- Proctor supervises test submission
  - If quiz, student just closes it on D2L
  - If written, student scans/uploads (via cell) to D2L dropbox (or Gradescope) with Proctor checking scan quality.
- Proctor releases student from exam.

Exam Workspace

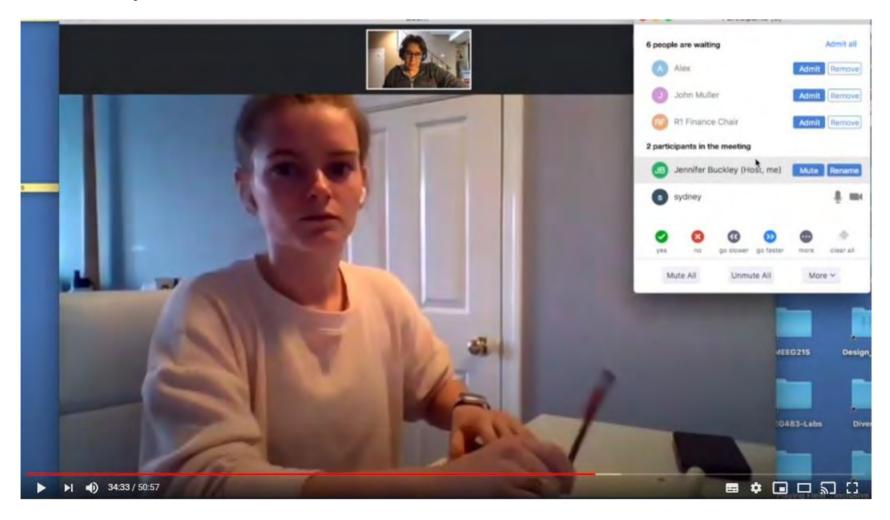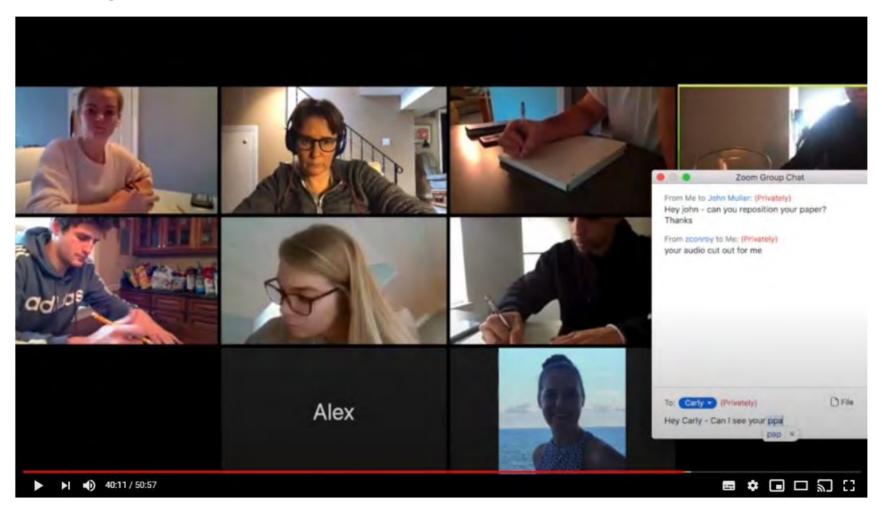# Exam Ready Position

Proctoring View

Thanks for listening (!), any questions ?

MEMORIAL
UNIVERSITY

A mid-semester report on an (online) writing-intensive linear algebra course

FYMSiC Online Conference: Teaching First-year Math and Stats Courses in Interesting Times

Jerrod M. Smith

University of Calgary
Department of Mathematics & Statistics
Calgary, Alberta, Canada

Email: `jerrod.smith@ucalgary.ca`

UNIVERSITY OF
CALGARY

May 23, 2020

Context

- MATH 311: Linear Methods II
  - 101 students
  - Second course in linear algebra: focus on writing proofs
- Students have varied background in proof writing
  - $\sim 50\%$ of students first-proof based course
- Attempting to use discussion boards to facilitate peer-instruction, provide practice communicating mathematics, and develop an online learning community

Setting up open discussion boards

- Frequently Asked Questions (6 topics, 13 questions)
- MATH 311 Café (3 topics, 2 posts... both started by me)
- Homework / Practice Problem Discussions (2 posts, 16 views)

Week 1: Fostering a learning community

- ▶ Writing Assignment #1: Learning Goals and Introduction
  - ▶ What are you hoping to learn by taking this course?
  - ▶ What is one specific learning goal that you want to make for yourself?
  - ▶ What aspects of the course and/or online learning are you most interested in or excited about?
  - ▶ What aspects of the course and/or online learning are you most unsure or nervous about?
  - ▶ Which art/music/sport/book/TV show/movie always makes you happy and why?
  - ▶ Choose two classmates' posts to respond to, and ask them a follow-up question based on their introduction post.
- ▶ Results: 103 threads (TAs posted as well); 341 student replies!

Week 2: Peer-Evaluation of Proof Writing

- ▶ Prompt identifies learning outcomes and expectations
- ▶ Students placed in randomized groups of 3
- ▶ **Step 1**: Write a complete and detailed proof of the following.
  - ▶ Let A be an $m \times n$ matrix. Prove that:
    $\text{Im}(A) = \{\vec{y} \in \mathbb{R}^m : \exists \vec{x} \in \mathbb{R}^n \text{ so that } \vec{y} = A\vec{x}\}$ is a subspace of $\mathbb{R}^m$.
- ▶ **Step 2**: Use our Peer Evaluation Rubric for Mathematical Writing to score your peer's proofs
  - ▶ Notation, Language & Clarify, Logic and Completeness
  - ▶ Provide constructive comments focussing on improvement
  - ▶ My "perfect proof" was provided for context (after original post)

Week 2: Peer-Evaluation of Proof Writing

So, what happened?

- Participation: 92 threads; 216 replies
- Students successfully identified
  - when part of the Subspace Test was missing
  - when variables were undefined
  - issues with some notation $0, \vec{0}, \vec{0}_n, \vec{0}_m$
- Students did not notice
  - issues with standard notation, e.g.: $\mathbb{R}^n$ vs. R^n
  - issues with quantifiers (if $\vec{y} \in \text{Im}(A)$, then there exists $\vec{x}$...)
  - logic errors when proofs were written in coordinates
- "Scores" higher than what we would give
- Extreme variability in detail/quality of comments
- **Why???**
  - Rubric scores "A, B, C" ... now "Good, Needs Improvement, Poor"
  - Limited experience reading / writing math
  - Exercise happened before students had received first feedback

Weeks 3, 4 and 5: The future!

- **Writing Assignment #3: Evaluation of a Flawed Proof**
  - Flawed proof provided (common mistakes with linear independence)
  - Prompt: apply the Revised Rubric to evaluate the proof
  - Replies: Did you give the proof the same scores?
    Did you find all the same errors?
- **Writing Assignment #4: Article Review / In the news**
  - Focus on applications – give students choice
  - Summarize an article (specific word limits)
  - Replies – ask clarifying questions
- **Writing Assignment #5: Repeat Peer-Evaluation**

Questions / Suggestions?

Thank you!

What is Mobius?

- Platform for creating and deploying online STEM courses including
    - lessons with text, slideshows, and videos
    - interactive learning activities
    - hands-on exercises; and
    - assessments

- Uses Maple in the backend

UNIVERSITY OF
WATERLOO | FACULTY OF MATHEMATICS
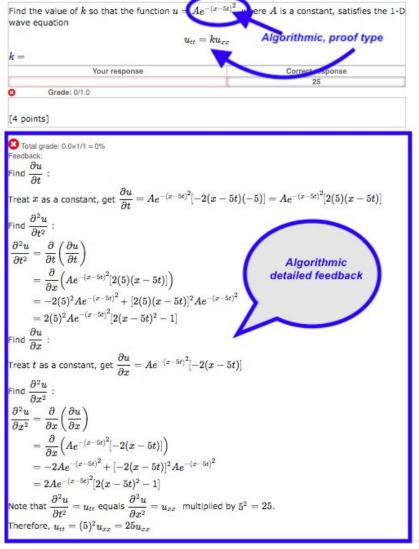
Course Design Philosophy

Design element	Mobius feature
Active learning	Embedded questions in text and slideshows
Metacognition/self-evaluation	Algorithmic and adaptive questions for lots of practice and immediate feedback
Accessibility	HTML/MathJax, alt-text, slideshow transcripts
Inquiry-based learning	GeoGebra explorations
Iteration	Analytics to measure effectiveness of course materials

UNIVERSITY OF WATERLOO | FACULTY OF MATHEMATICS

Algorithmic Questions

Conditional type

Determine the values of the constants α and β for which the function $u(x,t) = e^{\alpha t} \sin \beta x$ satisfies the 1-D heat equation.

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$ **Proof Type of Questions**

(Hint: The answer is not unique! Just find a pair that satisfies the equation.)

Enter α and β separated by a comma, in the order α followed by β:

$\alpha, \beta =$

Your response	Correct response
No answer	See the feedback.

❌ Grade: 0/1.0

[4 points]

❌ Total grade: 0.0×1/1 = 0%

Feedback:

Find $\dfrac{\partial u}{\partial t}$: Treat x as a constant, get $\dfrac{\partial u}{\partial t} = \alpha e^{\alpha t} \sin \beta x$

Find $\dfrac{\partial u}{\partial x}$: Treat t as a constant, get $\dfrac{\partial u}{\partial x} = \beta e^{\alpha t} \cos \beta x$

Find $\dfrac{\partial^2 u}{\partial x^2}$: Treat t as a constant again, get
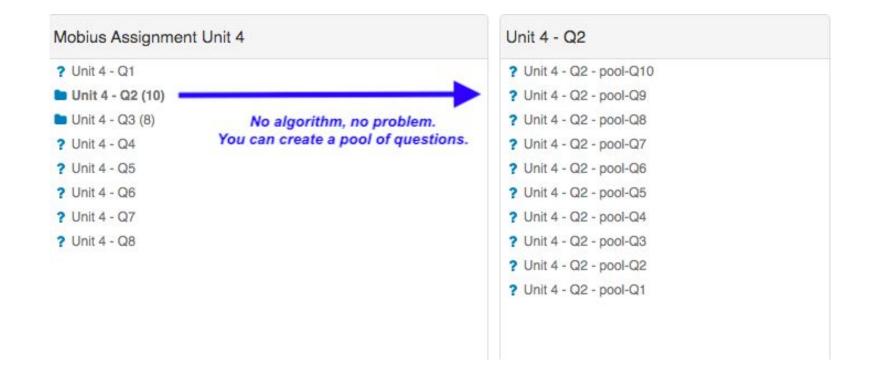
$\dfrac{\partial^2 u}{\partial x^2} = \dfrac{\partial}{\partial x}\left(\dfrac{\partial u}{\partial x}\right) = \dfrac{\partial}{\partial x}(\beta e^{\alpha t} \cos \beta x) = -\beta^2 e^{\alpha t} \sin \beta x$ Hence, to have

$\dfrac{\partial u}{\partial t} = \dfrac{\partial^2 u}{\partial x^2}$ we need $\alpha = -\beta^2$ Therefore, any constants α and β satisfying

$\alpha = -\beta^2$ will satisfy the given 1-D heat equation.   **Conditional acceptance**
Accept any such alpha and beta
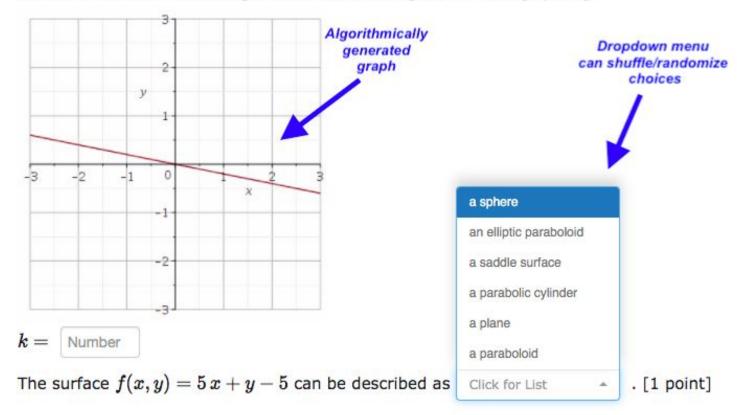
UNIVERSITY OF
WATERLOO | FACULTY OF MATHEMATICS

Question Pool

UNIVERSITY OF WATERLOO | FACULTY OF MATHEMATICS

Example Assignment Question

Find the k value that would generate the following level curve: [1 point]

Algorithmically generated graph

Dropdown menu can shuffle/randomize choices

a sphere

an elliptic paraboloid

a saddle surface

a parabolic cylinder

a plane

a paraboloid

$k =$ [Number]

The surface $f(x, y) = 5x + y - 5$ can be described as [Click for List]. [1 point]

UNIVERSITY OF WATERLOO | FACULTY OF MATHEMATICS

Week 1 data

1.2 — Geometric Interpretation of $z = f(x, y)$

Question	Description	Success rate	p-Value	d-Value	p-Biserial	r-Biserial	Count	Correct	Partial
(1)	🔍 1b1a_Geometric_Interpretation	0	0	0	-0	-	545	0	0
(2)	🔍 1b2a_Level_Curves	0	0	0	-0	-	545	0	0
(3)	🔍 1b2b_Level_Curves_Ex2	0	0	0	-0	-	545	0	0
(4)	🔍 1b2c_Level_Curves	0	0	0	-0	-	545	0	0
(5)	🔍 1b2d_Level_Curves_Ex3	0	0	0	-0	-	545	0	0
(6)	🔍 1b2e_Level_Curves	0	0	0	-0	-	545	0	0
(7)	🔍 1b3a_Cross_Sections	0	0	0	-0	-	545	0	0
(8)	🔍 1b4a_Generalization	0	0	0	-0	-	545	0	0
(9)	🔍 YT-line	0	0	0	-0	-	545	0	0
(10)	🔍 1b4b_Generalization	0.712	0.69	1	0.64	1.277	545	376	24
(11)	🔍 YT-line	0	0	0	-0	-	545	0	0
(12)	🔍 1b4c_Generalization	0	0	0	-0	-	545	0	0

91.3% sticked around

1.1 — Scalar Functions

Question	Description	Success rate	p-Value	d-Value	p-Biserial	r-Biserial	Count	Correct	Partial
(1)	🔍 1a1a_Scalar_Functions	0	0	0	-0	-	568	0	0
(2)	🔍 YT-line	0	0	0	-0	-	568	0	0
(3)	🔍 1a1b_Scalar_Functions_YT1	0.798	0.695	0.625	0.557	0.733	568	95	107
(4)	🔍 YT-line	0	0	0	-0	-	568	0	0
(5)	🔍 1a1c_Scalar_Functions	0	0	0	-0	-	568	0	0
(6)	🔍 YT-line	0	0	0	-0	-	568	0	0
(7)	🔍 1a1d_Scalar_Functions_YT2	0.79	0.773	0.466	0.734	1.021	568	39	20
(8)	🔍 YT-line	0	0	0	-0	-	568	0	0
(9)	🔍 1a2a_Domain_and_Range	0	0	0	-0	-	568	0	0
(10)	🔍 1a2b_Domain_and_Range	0.715	0.711	0.592	0.855	1.135	568	04	4
(11)	🔍 1a2c_Domain_and_Range	0.755	0.755	0.502	0.863	181	568	29	0
(12)	🔍 1a2d_Domain_and_Range	0	0	0	-0	-	568	0	0

1.3 — Putting It All Together

Question	Description	Success rate	p-Value	d-Value	p-Biserial	r-Biserial	Count	Correct	Partial
(1)	🔍 1c1_PIAT-Intro	0	0	0	-0	-	519	0	0
(2)	🔍 1c2_PIAT-WEx1-intro	0	0	0	-0	-	519	0	0

WATERLOO | FACULTY OF MATHEMATICS

Week 1 data

Mobius Assignment Unit 1 ⚠

Question	Description	Success rate	p-Value	d-Value	p-Biserial	r-Biserial	Count	Correct	Partial	Incorrect
(1)	Q Unit 1 - Q1	0.942	0.878	0.399	0.7	1.133	583	512	51	20
(2)	Q Unit 1 - Q2	0.935	0.866	0.438	0.751	1.185	583	505	59	19
(3)	Q Unit 1 - Q3	0.869	0.763	0.775	0.685	0.944	583	445	118	20
(4)	1 Q Unit 1 - Q4a	0.691	0.425	0.71	0.557	0.702	358	152	159	47
	2 Q Unit 1 - Q4d	0.776	0.533	0.673	0.552	0.692	375	200	144	31
	3 Q Unit 1 - Q4c	0.849	0.692	0.452	0.572	0.75	351	243	91	17
	4 Q Unit 1 - Q4b	0.87	0.705	0.436	0.585	0.773	346	244	73	29

584-568=15
Only 2.5%
skipped the lessons

UNIVERSITY OF WATERLOO | FACULTY OF MATHEMATICS

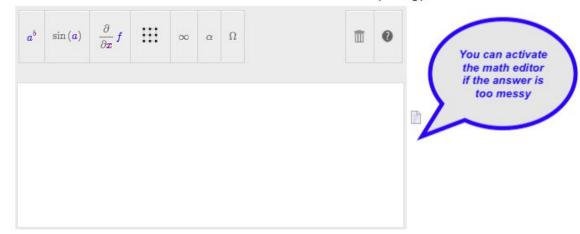# Student feedback from first week of class

How is the course going so far?"

- "I am finding the practice questions very helpful in reiterating concepts and the Mobius attempts."
- "I'm enjoying how this course is building onto the previous calculus course, it makes it fun to learn. "
- "I'm really liking Math237 thus far! I found the course outline to be really clear and easy to follow. I also think Mobius is such a cool platform, and the online demonstrations are definitely helping me to better visualize the 3D concepts!"
- "Everything is great so far and I will keeping going"
- "The course so far has been great. I find practices in Mobius and Put It All Together has been really helpful for understanding the material. Thanks for been so organized."
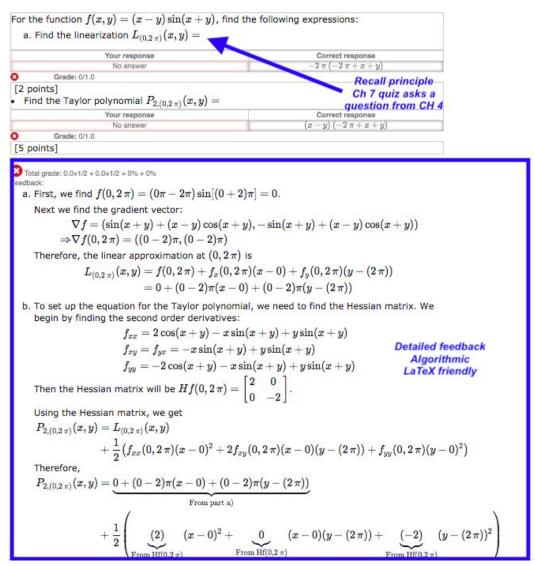
UNIVERSITY OF
WATERLOO | FACULTY OF MATHEMATICS

Math Editor

$f(x, y, z) = 5\sin(xyz)$, $(a, b, c) = \left(1, 1, \dfrac{\pi}{4}\right)$, and $\vec{v} = (3, -\sqrt{2}, 3)$.

a. Calculate the directional derivative of f at the point $(a, b, c) = \left(1, 1, \dfrac{\pi}{4}\right)$ in the direction defined by $\vec{v}$. [4 points]
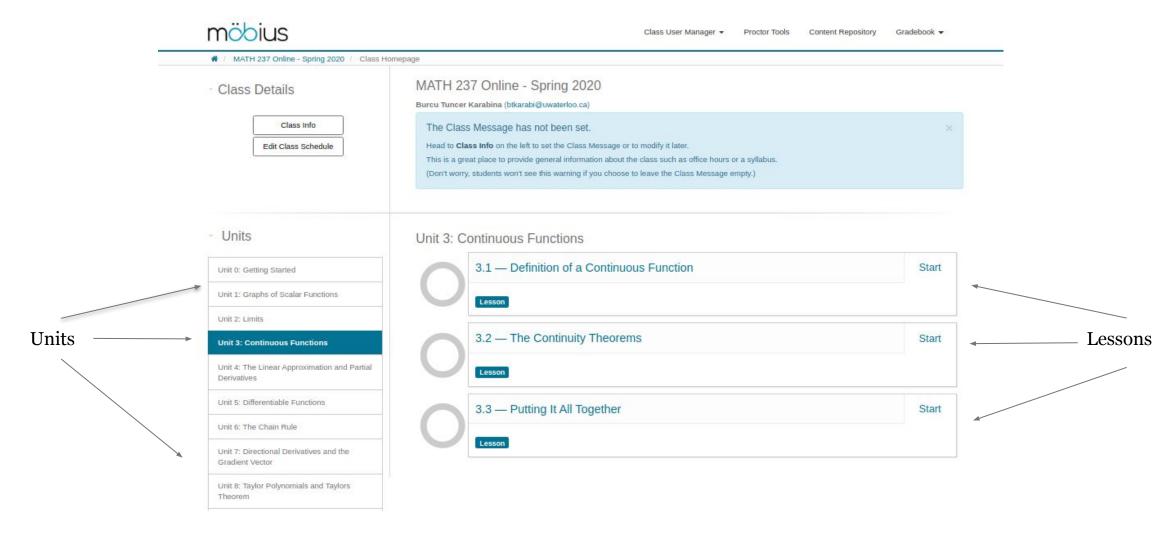
| a^b | $\sin(a)$ | $\dfrac{\partial}{\partial x} f$ | ⠿ | ∞ | α | Ω | | 🗑 | ❓ |

You can activate the math editor if the answer is too messy

b. Find the direction at $(a, b, c) = \left(1, 1, \dfrac{\pi}{4}\right)$ in which the rate of change of f is greatest. [1 point]

c. Find the maximum rate of change. [1 point]

d. Fill in the blank: f decreases the most at $(a, b, c) = \left(1, 1, \dfrac{\pi}{4}\right)$ in the direction of
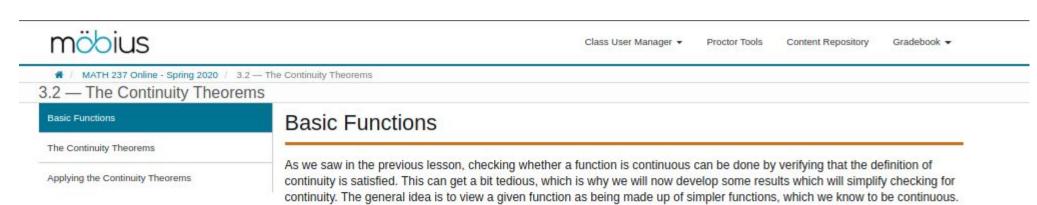
[1 point]

UNIVERSITY OF
WATERLOO | FACULTY OF MATHEMATICS

Interleaving

For the function $f(x,y) = (x-y)\sin(x+y)$, find the following expressions:

a. Find the linearization $L_{(0,2\pi)}(x,y) =$

Your response	Correct response
No answer	$-2\pi(-2\pi+x+y)$

❌ Grade: 0/1.0

Recall principle
Ch 7 quiz asks a
question from CH 4

[2 points]
- Find the Taylor polynomial $P_{2,(0,2\pi)}(x,y) =$

Your response	Correct response
No answer	$(x-y)(-2\pi+x+y)$

❌ Grade: 0/1.0

[5 points]

❌ Total grade: 0.0×1/2 + 0.0×1/2 = 0% + 0%
Feedback:

a. First, we find $f(0, 2\pi) = (0\pi - 2\pi)\sin[(0+2)\pi] = 0$.

Next we find the gradient vector:
$$\nabla f = (\sin(x+y) + (x-y)\cos(x+y), -\sin(x+y) + (x-y)\cos(x+y))$$
$$\Rightarrow \nabla f(0, 2\pi) = ((0-2)\pi, (0-2)\pi)$$

Therefore, the linear approximation at $(0, 2\pi)$ is
$$L_{(0,2\pi)}(x,y) = f(0, 2\pi) + f_x(0, 2\pi)(x-0) + f_y(0, 2\pi)(y - (2\pi))$$
$$= 0 + (0-2)\pi(x-0) + (0-2)\pi(y-(2\pi))$$

b. To set up the equation for the Taylor polynomial, we need to find the Hessian matrix. We begin by finding the second order derivatives:
$$f_{xx} = 2\cos(x+y) - x\sin(x+y) + y\sin(x+y)$$
$$f_{xy} = f_{yx} = -x\sin(x+y) + y\sin(x+y)$$
$$f_{yy} = -2\cos(x+y) - x\sin(x+y) + y\sin(x+y)$$

Detailed feedback
Algorithmic
LaTeX friendly

Then the Hessian matrix will be $Hf(0, 2\pi) = \begin{bmatrix} 2 & 0 \\ 0 & -2 \end{bmatrix}$.

Using the Hessian matrix, we get
$$P_{2,(0,2\pi)}(x,y) = L_{(0,2\pi)}(x,y)$$
$$+ \frac{1}{2}\left(f_{xx}(0, 2\pi)(x-0)^2 + 2f_{xy}(0, 2\pi)(x-0)(y-(2\pi)) + f_{yy}(0, 2\pi)(y-0)^2\right)$$

Therefore,
$$P_{2,(0,2\pi)}(x,y) = \underbrace{0 + (0-2)\pi(x-0) + (0-2)\pi(y-(2\pi))}_{\text{From part a)}}$$

$$+ \frac{1}{2}\left(\underbrace{(2)}_{\text{From Hf}(0,2\pi)}(x-0)^2 + \underbrace{0}_{\text{From Hf}(0,2\pi)}(x-0)(y-(2\pi)) + \underbrace{(-2)}_{\text{From Hf}(0,2\pi)}(y-(2\pi))^2\right)$$

UNIVERSITY OF **WATERLOO** | FACULTY OF MATHEMATICS

MATH 237 Online Layout: Course

UNIVERSITY OF WATERLOO | FACULTY OF MATHEMATICS

MATH 237 Online Layout: Lessons

UNIVERSITY OF
WATERLOO | FACULTY OF MATHEMATICS

Teaching Calculus I Online

Lauren DeDieu

University of Calgary

First-Year Math and Stats in Canada Online Conference: Teaching First-year Math and Stats Courses in Interesting Times (to say the least), May 2020

Context:

- Coordinated **first-year calculus** in the Winter 2020 (~550 students) and Spring 2020 (~350 students)

- This is the calculus course for all non-engineering students.

- I made design changes in the Spring 2020 term
  (informed by my experiences in the Winter)

In this talk, I will discuss **design changes** which appear to be having a **positive impact** on students (...which I plan to continue using even after in-person classes return).

"Flipped Classroom"

Weekly Schedule (Spring 2020):

- **Tuesday:** Watch Topic A videos. Do Topic A quiz.
- **Wednesday:** Topic A Review (9 – 11:30am)

- **Thursday:** Watch Topic B videos. Do Topic B quiz.
- **Friday:** Topic B Review (9 – 11:30am)

- **Monday:** Topics AB Lab (10am – 12pm), WeBWorK Topic AB due.

"Flipped Classroom"

Positive Impact:

- **Quiz** pushes students to come to lecture with questions.

- Getting emails about the quiz questions helps me know what students are struggling with prior to lecture.

D2L Checklist

Week 1 ⌄

🔖 ‹ ›

11.11 % 1 of 9 items complete

Quizzes

☑ Topic 1B   Due May 7, 2020 11:59 PM

- Topic 1B Quiz

WeBWorK

☐ Topic 1B   Due May 11, 2020 11:59 PM

WeBWorK #1 (Topic 1B)

Homework

☐ Topic 1B

- Homework 1B

Video Slides

☐ Topic 1B

- Topic 1B - Limits, Infinite Limits, Calculating Limits, Squeeze Theorem

Topic 1B Videos

☐ Limits

- Limits - Introduction
- Limits - One-Sided Limits

☐ Infinite Limits

- Infinite Limits - Introduction
- Infinite Limits - Example

☐ Limits Recap

- Limits Recap - What Can Go Wrong?

☐ Calculating Limits

- Calculating Limits - Substitution Rule
- Calculating Limits - Example 1
- Calculating Limits - Limit Laws
- Calculating Limits - Example 2
- Calculating Limits - Absolute Values

☐ Squeeze Theorem

- Squeeze Theorem - Introduction
- Squeeze Theorem - Example

D2L Checklist

Positive Impact:

- Outlines exactly what needs to be done that week with links. (Students love it!)

"I like how organised d2l is and the **weekly checklists ARE A LIFE SAVER** i can never forget now :)"

"*the course is highly organized. I like the **weekly checklists** because they help me stay on track and **feel like i am not missing anything**. it is easy to navigate D2L and find what information i am looking for*"

*These quotes are responses to an anonymous survey question, "What do you like most about the Course Design"?

Timed Mock Midterm

Positive Impact:

- Simulates a timed exam setting better than posting past midterms.

*I honestly wasn't too sure about a few questions, while I've done them on assignments and quizzes, I struggled through completing them on those and as well as this. This is a **big reality check** for me for the midterm coming up on Monday, and I am **planning on studying the next 3 days** and doing practise problem.* - Email from Student

*I just wanted to let you know that this was an **EXTREMELY useful exercise** not just in terms of doing the work under time pressure, but grappling with the technology. … GREAT learning for the actual Midterm. Thank you for doing the additional work to let us experience this!!!* -Email from Student

Discussion Board

Positive Impact:

- A nice venue to ask questions (220 posts so far 2 weeks into semester)

Topic 2AB Questions ⌄

Limits at Infinity, Continuity, Intermediate Value Theorem, Derivatives

Topic	Threads	Posts	Last Post
2A, 2B Videos ⌄	2	4	Almaz Butaev May 12 at 7:51 PM
2A, 2B Homework ⌄	15	37	Almaz Butaev Wed at 5:41 AM
WeBWorK #2 (Topics 2A, 2B) ⌄ Do not post full solutions here. But feel free to give hints.	15	53	Lauren DeDieu May 18 at 10:41 PM
Other 2AB Questions ⌄	1	4	Lauren DeDieu Wed at 4:12 PM

Honourable Mentions

- **Zoom Office Hours**

- **Online chat during lectures**

Thank You

lauren.dedieu@ucalgary.ca

DESIGNING ASSESSMENTS AND FOSTERING COMMUNITY WHILE TEACHING MATH AND STATISTICS REMOTELY

Ann Gagné, PhD

Educational Developer

Robert Gillespie Academic Skills Centre

University of Toronto-Mississauga

OUTLINE

- Assessment Strategies
- Community Building
- Q&A

ASSESSMENT INSTRUCTIONS

- Instructions include steps or points to follow (instructions can be provided via video)

- Instructions demonstrate alignment to course learning outcomes

- Feedback (automated, video, audio)

SCAFFOLDING

- Scaffold concepts in assignments as the course progresses
- Formative activities leading to summative assessments
  - Quizzes to tests
  - Question banks to problem sets
- These can be individual activities or group activities

TEACHING AND LEARNING ACTIVITIES EXAMPLES

1. **Student Engagement**: Immediate response in lecture, polls & surveys using instructional tech (Zoom polls, Mentimeter)

2. **Active Learning**: Participatory questions in lecture, case studies, student-generated test questions, student-curated resources

3. **Collaborative Learning**: Breakout groups, wikis, blogs, podcasts, **video demos**, **projects**

4. **Summative**: Wiki, test, **case studies**, exam (practice exam, exam wrappers)

See Yang (2017)

SCAFFOLDED ASSESSMENT

STATISTICS

- Explain why a concept would be used in a specific scenario (e.g. Linear regression)

- Calculate linear regression of scenario showing work

- Presentation of final result, graphically

- Propose another similar or counter scenario, explain in a video or gif

ASSESSMENTS AND UNIVERSAL DESIGN

- Intentionality

- Multiple means:

  - **Representation** (how you provide instruction)

  - **Engagement** (how students participate and address concepts)

  - **Expression** (how students submit their work)

    (CAST 2020)

ACCESS CHECKS

Checking in with students about where they are at and acknowledging:
- Technology
- Space

Why? Because it supports inclusion, models community, and supports mindfulness.

WHAT IS PRESENCE ONLINE?

- Social
- Teaching
- Cognitive

See Boettcher & Conrad (2016)

COMMUNITY PRESENCE-ASYNCHRONOUSLY

- Clear communication practices

- Model community with course design

- Wikipages, discussion boards

- FAQ Videos

- Feedback Videos

COMMUNITY PRESENCE-SYNCHRONOUSLY

- Communication practices document (student group feedback)
- Office hours
- Breakout rooms
- Chat
- Social media (if comfortable)

CLASSROOM ENGAGEMENT

- Profile - photo & description
- Take class "pulse" & tone with surveys, feedback, reflection
- Communication framework make it clear who will be responding and move from "responding" to "moderating"
- Consider reminders - aligned with course scaffolded elements

CULTIVATE COMMUNITY

- Plan your introduction - allow the students to know something about you
- Get to know your students - deliberate questions
- Lay the foundation upon which further community will be built

RESOURCES

- Boettcher, J.V. & Conrad, R-M. (2016). *Online Teaching Survival Guide: Simple and Practical Pedagogical Tips*. New York: Jossey-Bass.

- CAST (2018). Universal Design for Learning Guidelines version 2.2. Retrieved from http://udlguidelines.cast.org

- McCabe, D.L., Klebe Trevino, L., & Butterfield, K.D. (2001) Cheating in Academic Institutions: A Decade of Research. *Ethics &Behavior 11*(3), 219-232, DOI: 10.1207/S15327019EB1103_2

- Miller, J. (2020). Make EduGifs. Retrieved from https://jakemiller.net/

- Yang, D. (2017). Instructional strategies and course design for teaching statistics online: perspectives from online students. *International Journal of STEM Education* 4:34 DOI 10.1186/s40594-017-0096-x

THANK YOU!

ann.gagne@utoronto.ca

Twitter:

@utmTLC

@AnnGagne
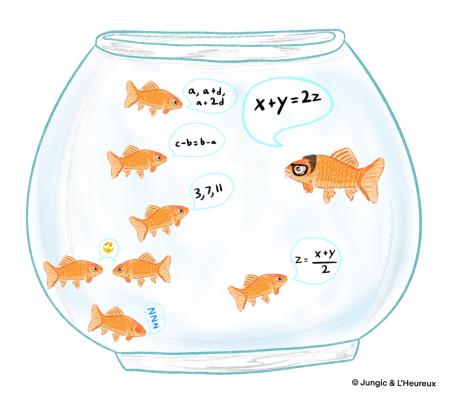
If x = COVID-19, then what is $x + 1$?

Veselin Jungic

Department of Mathematics

SFU

$x - 1 =$ Pre COVID-19

Question

Is there a function f for which
$$f(x) < 0?$$

Example: Take
f = academic integrity

Question

Is there a function f for which
$$f(x) > 0?$$

Example: Take
$$f = \text{experience with remote teaching}$$

Conjecture

If f is a reasonable function, then
f(x) ≠ 0.

If $x =$ COVID-19, then what is $x + 1$?

A: COVID-18, because $-19 + 1 = -18$
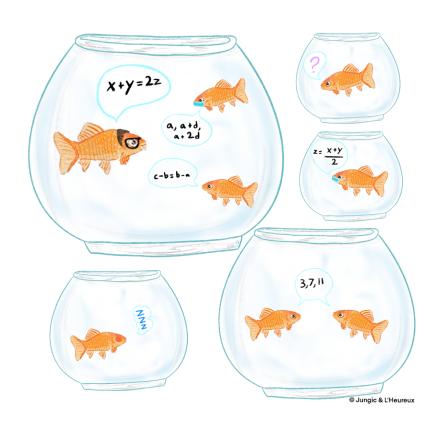
B: COVID-19, because COVID-19 is there to stay

C: COVID-20, because COVID-20 comes after COVID-19

D: Undefined

E: What ever it is, it is scary.

F: I do not want to think about this

If x = COVID-19, then what is $x + 1$: A Personal Take

Thank You!

vjungic@sfu.ca

Context

University of Toronto Mississauga:

- 14,500 students

Context

University of Toronto Mississauga:

- 14,500 students
- Program of Study
    - Commerce/Economics and Computer Science are competitive

Context

University of Toronto Mississauga:

- 14,500 students
- Program of Study
  - Commerce/Economics and Computer Science are competitive
- Three levels of integrity committee
  - Departmental
  - Decanal
  - Tribunal

Provost's Report

Decanal Level Infractions - Sanctioned Only

Year	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Number	382	432	503	511	582
Percentage	3.0%	3.2%	3.6%	3.6%	4.0%

Math - Final Exams - April 2020

- 1 person does all the work per class
- ~30 minutes per student
- Only work on cases with sure convictions

Math - Final Exams - April 2020

- 1 person does all the work per class
- ~30 minutes per student
- Only work on cases with sure convictions

First year courses, final exams only: 210 cases