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

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NOTES TAKEN DURING THE PRESENTATIONS (Xinli Wang)

SLIDES:
- GRADESCOPE (John Craighead)
- ONLINE PROCTORING PILOT (John Craighead)
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- 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
- 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 $x = \text{COVID-19}$, then what is $x+1$?
Speaker: Veselin Jungic (Simon Fraser University)
• $x-1 = \text{pre COVID-19}$ $x = \text{COVID-19}$ 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.
- 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)


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

<table>
<thead>
<tr>
<th>Platform</th>
<th>Electronic Start to End</th>
<th>Grouping by Question #</th>
<th>Grouping by Solutions</th>
<th>Regrade Option</th>
<th>+ Code audit &amp; marking</th>
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<td>w/o AI</td>
<td>w. AI</td>
<td>w. AI</td>
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<td>less</td>
<td>Traditional + (comments)</td>
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<tr>
<td>Crowdmark</td>
<td>Easy</td>
<td>n/a</td>
<td>Less</td>
<td>Traditional + (comments)</td>
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<tr>
<td>Gradescope</td>
<td>More</td>
<td>MORE</td>
<td>Less</td>
<td>Traditional ++ (comments, regrades)</td>
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<th>Student Satisfaction</th>
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<td>w. AI</td>
<td>w. AI</td>
<td>w. Regrade</td>
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<td>Gradescope</td>
<td>Better if good rubrics</td>
<td>BETTER if good rubrics &amp; grouping</td>
<td>Better faster return, more feedback</td>
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## MEMORIAL UNIVERSITY

DEPT. OF MATH & STATS
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!

GROUP 1 (Graded)
- All 32 Answers Confirmed
- Rename, Merge, Delete & Ungroup Answers, Grade

GROUP 2 (Graded)
- All 10 Answers Confirmed
- Rename, Merge, Delete & Ungroup Answers, Grade

GROUP 3 (Graded)
- All 4 Answers Confirmed
- Rename, Merge, Delete & Ungroup Answers, Grade
Looking inside one group . . .

\[ y' = \frac{y}{2y + x} \text{ (merged)} \]

GROUP 2: GRADED
- All 10 Answers Confirmed
- Rename, Merge, Delete & Ungroup Answers, Grade

Unconfirmed 3 Confirmed 10

MATH 1000(081)
FALL 2019

Question #3 [8 marks]
Given that \( y^2 - xy = 4 \), please do the following.

\[ y' = \frac{y}{2y + x} \]

3. a) Find \( y' = \frac{dy}{dx} \)

\[ 2y \frac{dy}{dx} - (1 \cdot \frac{dy}{dx} + x \cdot 1 \cdot \frac{dy}{dx}) = 0 \]
\[ 2y \frac{dy}{dx} - y + x \frac{dy}{dx} = 0 \]
\[ 2y \frac{dy}{dx} + x \frac{dy}{dx} = y \]

\[ y' = \frac{y}{2y + x} \]

. . . 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!
Grading Rubric
(standardizes marking)

Regrade Request
(facilitates teaching aspect of marking)

TOTAL POINTS
4.0 / 4.0 pts

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
\[
\frac{2 - 4}{-2 + 3}
\]

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 answer 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.
Code Auditing & Marking  
(in addition to traditional assignments)  

- 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:  
  - 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
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
**Preparation**
- 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

Prepare your **exam workspace**.

- Quiet room with minimal through-traffic from other people
- Only instructor-permitted materials on work surface
- All other electronics other than personal computer turned off
- Cell phones in location as specified by proctor
Exam Ready Position
Proctoring View
Thanks for listening (!), any questions?
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

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 focusing 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!
Our online experience with Mobius

23/05/20

Amanda Garcia
amanda.garcia@uwaterloo.ca

and

Burcu Karabina
btkarabina@uwaterloo.ca
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
## Course Design Philosophy

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

Find the value of \( k \) so that the function \( u(x,t) = Ae^{-(x-5t)^2} \), where \( A \) is a constant, satisfies the 1-D wave equation

\[
\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}.
\]

**Algorithmic, proof type**

**Algorithmic detailed feedback**

**Feedback:**

Find \( \frac{\partial u}{\partial t} \).

Treat \( f \) as a constant, get \( \frac{\partial u}{\partial t} = Ae^{-(x-5t)^2} \cdot 2(5x-M)(-5) = Ae^{-(x-5t)^2}[2(5x-M)(-5)] \).

Find \( \frac{\partial^2 u}{\partial t^2} : \)

\[
\frac{\partial^2 u}{\partial t^2} = \frac{\partial}{\partial t}\left( \frac{\partial u}{\partial t} \right) = \frac{\partial}{\partial t}\left( Ae^{-(x-5t)^2}[2(5x-M)(-5)] \right)
\]

\[
= -2Ae^{-(x-5t)^2}[2(5x-M)(-5)]\frac{\partial}{\partial t}\left( 5x-M \right)
= -2Ae^{-(x-5t)^2}[2(5x-M)(-5)]\frac{\partial}{\partial t}\left( 5x-M \right)
= 2Ae^{-(x-5t)^2}(2(5x-M)(-5))^2 - 1.
\]

Find \( \frac{\partial u}{\partial x} \).

Treat \( f \) as a constant, get \( \frac{\partial u}{\partial x} = Ae^{-(x-5t)^2}[-2(5x-M)] \).

Find \( \frac{\partial^2 u}{\partial x^2} : \)

\[
\frac{\partial^2 u}{\partial x^2} = \frac{\partial}{\partial x}\left( \frac{\partial u}{\partial x} \right) = \frac{\partial}{\partial x}\left( Ae^{-(x-5t)^2}[-2(5x-M)] \right)
\]

\[
= -2Ae^{-(x-5t)^2}[-2(5x-M)]\frac{\partial}{\partial x}\left( 5x-M \right)
= 2Ae^{-(x-5t)^2}[2(5x-M)^2 - 1].
\]

Note that \( \frac{\partial^2 u}{\partial t^2} = \frac{\partial u}{\partial t} \) equals \( \frac{\partial^2 u}{\partial x^2} \) multiplied by \( 5^4 = 25 \).

Therefore, \( u_{tt} = (5)^2 u_{xx} = 25 u_{xx} \).
Conditional type

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

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$$

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

Enter $\alpha$ and $\beta$ separated by a comma, in the order $\alpha$ followed by $\beta$:

$$\alpha, \beta =$$

<table>
<thead>
<tr>
<th>Your response</th>
<th>Correct response</th>
</tr>
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<tbody>
<tr>
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<table>
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[4 points]

Feedback:

- Find $\frac{\partial u}{\partial t}$: Treat $x$ as a constant, get $\frac{\partial u}{\partial t} = \alpha e^{\alpha t} \sin \beta x$
- Find $\frac{\partial u}{\partial x}$: Treat $t$ as a constant, get $\frac{\partial u}{\partial x} = \beta e^{\alpha t} \cos \beta x$
- Find $\frac{\partial^2 u}{\partial x^2}$: Treat $t$ as a constant again, get $\frac{\partial^2 u}{\partial x^2} = \frac{\partial}{\partial x} (\frac{\partial u}{\partial x}) = \beta \frac{\partial}{\partial x} (\beta e^{\alpha t} \cos \beta x) = -\beta^2 e^{\alpha t} \sin \beta x$. Hence, to have $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ we need $\alpha = -\beta^2$. Therefore, any constants $\alpha$ and $\beta$ satisfying $\alpha = -\beta^2$ will satisfy the given 1-D heat equation.

Conditional acceptance
Accept any such alpha and beta
## Question Pool

### Mobius Assignment Unit 4

- Unit 4 - Q1
- Unit 4 - Q2 (10)
- Unit 4 - Q3 (8)
- Unit 4 - Q4
- Unit 4 - Q5
- Unit 4 - Q6
- Unit 4 - Q7
- Unit 4 - Q8

*No algorithm, no problem. You can create a pool of questions.*

### Unit 4 - Q2

- Unit 4 - Q2 - pool-Q10
- Unit 4 - Q2 - pool-Q9
- Unit 4 - Q2 - pool-Q8
- Unit 4 - Q2 - pool-Q7
- Unit 4 - Q2 - pool-Q6
- Unit 4 - Q2 - pool-Q5
- Unit 4 - Q2 - pool-Q4
- Unit 4 - Q2 - pool-Q3
- Unit 4 - Q2 - pool-Q2
- Unit 4 - Q2 - pool-Q1
Example Assignment Question

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

The surface $f(x, y) = 5x + y - 5$ can be described as... [1 point]
### Week 1 data

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

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<th>Description</th>
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<th>d-Value</th>
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#### Scalar Functions

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#### Putting It All Together

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# Week 1 data

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584 - 568 = 15

Only 2.5%

skipped the lessons
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.”
\[ f(x, y, z) = 5 \sin(xyz), \quad (a, b, c) = \left(1, 1, \frac{\pi}{4}\right), \text{ and } \vec{v} = (3, -\sqrt{2}, 3). \]

a. Calculate the directional derivative of \( f \) at the point \((a, b, c) = \left(1, 1, \frac{\pi}{4}\right)\) in the direction defined by \( \vec{v} \). [4 points]

b. Find the direction at \((a, b, c) = \left(1, 1, \frac{\pi}{4}\right)\) 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 \((a, b, c) = \left(1, 1, \frac{\pi}{4}\right)\) in the direction of [1 point]
Interleaving

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

a. Find the linearization $L_{(0,2\pi)}(x, y) = \quad$ [Correct response]

b. Find the Taylor polynomial $P_3_{(0,2\pi)}(x, y) = \quad$ [Correct response]

Recall principle: Ch 7 quiz asks a question from CH 4

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

Next we find the gradient vector:

$\nabla f = (\sin(x + y) + (x - y)\cos(x + y), -\sin(x + y) + (x - y)\cos(x + y))$

$\Rightarrow \nabla f(0, 2\pi) = ((0 - 2\pi)\cos((0 + 2\pi)), (0 - 2\pi)\sin((0 + 2\pi)))$

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:

$f_{xx} = -2\cos(x + y) - x\sin(x + y) + y\sin(x + y)$

$f_{yx} = f_{xy} = -\sin(x + y) + y\sin(x + y)$

$f_{yy} = -2\cos(x + y) - x\sin(x + y) + y\sin(x + y)$

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

Using the Hessian matrix, we get

$P_3_{(0,2\pi)}(x, y) = L_{(0,2\pi)}(x, y)$

$+ \frac{1}{2} f_{xx}(0, 2\pi)(x - 0)^2 + 2f_{xy}(0, 2\pi)(x - 0)(y - (2\pi)) + f_{yy}(0, 2\pi)(y - (2\pi))^2$

Therefore,

$P_3_{(0,1,\pi)}(x, y) = 0 + (0 - 2\pi)(x - 0) + (0 - 2\pi)(y - (2\pi))$

$+ \frac{1}{2} \left( \frac{2}{(0 - 0)^2} \right)(x - 0)^2 + \frac{0}{(0 - 0)(y - (2\pi))} + \frac{(-2)}{(y - (2\pi))^2}$
3.2 — The Continuity Theorems

Basic Functions

As we saw in the previous lesson, checking whether a function is continuous can be done by verifying that the definition of continuity is satisfied. This can get a bit tedious, which is why we will now develop some results which will simplify checking for continuity. The general idea is to view a given function as being made up of simpler functions, which we know to be continuous.

We will call these simpler functions basic functions, which are known to be continuous on their domains. In this course, you can take the continuity of these functions on their domains as a given:

- the constant function \( f(x, y) = k \)
- the power functions \( f(x, y) = x^n, f(x, y) = y^n \)
- the logarithm function \( \ln(\cdot) \)
- the exponential function \( e^{\cdot} \)
- the trigonometric functions, \( \sin(\cdot), \cos(\cdot), \) etc.
- the inverse trigonometric functions, \( \arcsin(\cdot), \) etc.
- the absolute value function \(|\cdot|\)

Now that we have our list of basic functions, let's see how we can assemble them into more complicated functions using operations.
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
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

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 practice 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

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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
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)
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


THANK YOU!

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If $x = \text{COVID-19}$, then what is $x + 1$?

Veselin Jungic
Department of Mathematics
SFU
\[ x - 1 = \text{Pre COVID-19} \]
\[ x = \text{COVID} - 19 \]
Question

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

Example: Take $f = \text{academic integrity}$
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 $f(x) \neq 0$. 

If \( x = \text{COVID-19} \), 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: Whatever it is, it is scary.

F: I do not want to think about this
If \( x = \text{COVID-19} \), then what is \( x + 1 \): A Personal Take
Thank You!

vjungic@sfu.ca
Academic Integrity

The statistics of COVID induced cheating
University of Toronto Mississauga:

- 14,500 students
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
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</thead>
<tbody>
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<td><strong>Number</strong></td>
<td>382</td>
<td>432</td>
<td>503</td>
<td>511</td>
<td>582</td>
</tr>
<tr>
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<td>3.2%</td>
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<td>3.6%</td>
<td>4.0%</td>
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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