SCHOLARSHIP OF EXCELLENCE IN TEACHING – COHORT 2021

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2 GOAL

Design Interactive Applied Calculus course for a remote setting, by incorporating active and collaborative learning strategies.

3 Course Woes

Difficulty understanding the concept of derivative and applying this knowledge in the context of a real-world situation.

Inability to interpret the concept of derivative using proper notation in a word problem.

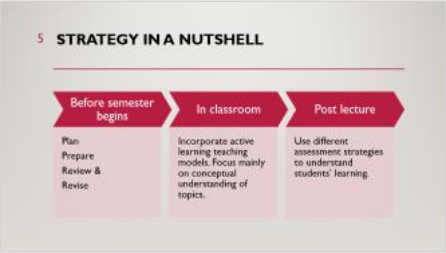
Algebraic errors during problem solving.

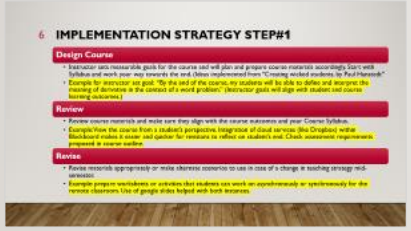
Poor retention and recall of concepts, skills and techniques throughout the semester (and beyond!)

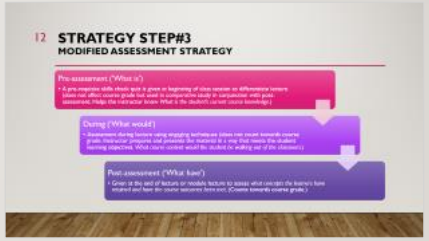
Initial diagnostic test results on prerequisite material were poor.

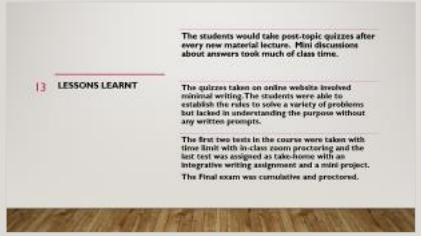
	A	B	C	D	E	F
1						Math 150 Diag
2					Chapter Co	GR, A
3					Weight	10
4						
5	Last name	First name	Email	Log-in		Score
6						0
7						30
8						50
9						50
10						30
11						70
12						40
13						50
14						0
15						30
16						60
17						50
18						80
19						50
20						60
21						40
22						10
23						40
24						40
25						40
26						20
27						60
28					**Average:**	40.90909
29						
30	Course:	Fall2021-Math150-ProfKolluru				
31	Course ID:	XL3Z-O1JT-0020-0U42				

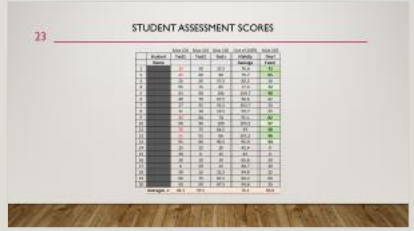
4 PRESENTATION OVERVIEW











5 STRATEGY IN A NUTSHELL

Before semester begins	In classroom	Post lecture
Plan Prepare Review & Revise	Incorporate active learning teaching models. Focus mainly on conceptual understanding of topics.	Use different assessment strategies to understand students' learning.

6 IMPLEMENTATION STRATEGY STEP#1

Design Course

- Instructor sets measurable goals for the course and will plan and prepare course materials accordingly. Start with Syllabus and work your way towards the end. (Ideas implemented from "Creating wicked students, by Paul Hanstedt"
- Example for instructor set goal: "By the end of the course, my students will be able to define and interpret the meaning of derivative in the context of a word problem." (Instructor goals will align with student and course learning outcomes.)

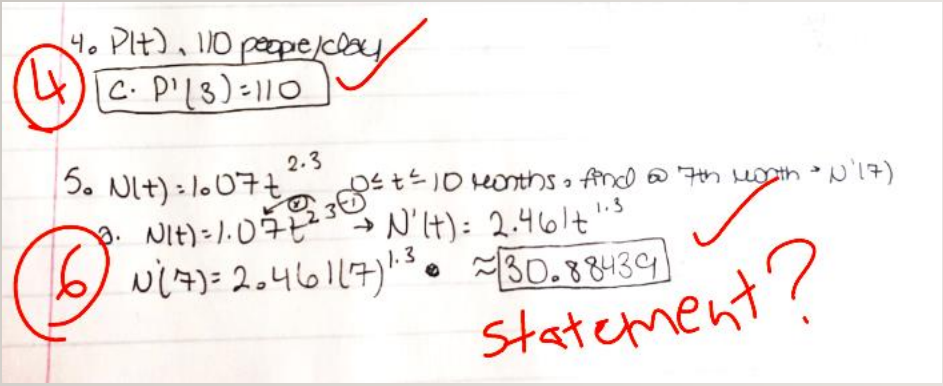
Review

- Review course materials and make sure they align with the course outcomes and your Course Syllabus.
- Example: View the course from a student's perspective. Integration of cloud services (like Dropbox) within Blackboard makes it easier and quicker for revisions to reflect on student's end. Check assessment requirements proposed in course outline.

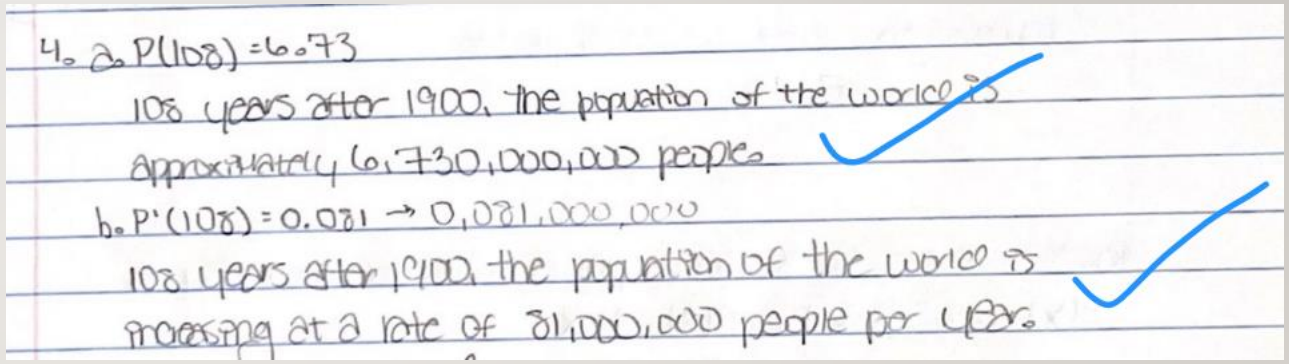
Revise

- Revise materials appropriately or make alternate scenarios to use in case of a change in teaching strategy mid-semester.
- Example: prepare worksheets or activities that students can work on asynchronously or synchronously for the remote classroom. Use of google slides helped with both instances.

7 Example of student work: Interpret the meaning of derivative



Test#1



Final Exam

IMPLEMENTATION STRATEGY STEP#2 IN CLASSROOM REMOTE SESSION

New topic presented to students via interactive lecture. Extensive use of Zoom chat feature.

Used the "Think – Pair – Share" strategy

For the current remote class, Zoom breakout sessions and Google slides was implemented.

In-class worksheet, used for student discussion after lecture:

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1. The eating behavior of a typical human during a meal can be described by

$$I(t) = 27 + 72t - 1.5t^2,$$

where t is the number of minutes since the meal began, and $I(t)$ represents the amount (in grams) that this person has eaten at time t. ***Source: Appetite.***

   a. How many grams of food has the typical human consumed after 10 minutes and after 24 minutes?

   a. Find the rate of change of intake of food for the typical human, $I'(t)$, using the definition of the derivative.

   a. Find the rate of change of food intake for the typical human at 10 minutes and at 24 minutes. Be sure to state your units.

   a. Consider the value you found for the rate of change of food intake at 24 minutes. Explain why this answer makes sense.

   a. What would be a reasonable domain for this function?

Answers:

4a.	597 grams, 891 grams
4b.	$I'(t) = 72 - 3t$
4c.	42 grams/minute, 0 grams/minute
4d.	After 24 minutes the person probably has completed the meal.
4e.	$[0,\ 24]$

Google slides in remote class for group work in breakout sessions:

11-3-2021 Sec 4.6 homework

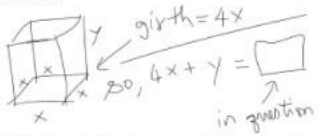
File Edit View Insert Format Tools Add-ons Help See new changes

Share

60% Normal text Arial 11

Question 11

Part (a):



Solve for y in the above equation and set it aside

Next, let's find Volume function

Vol V = length * width * height = x * x * y =

84=L+4x

L=84-4x

v(x)=Lx^2 =>84x^2-4x^3

v(x)=(0,21)

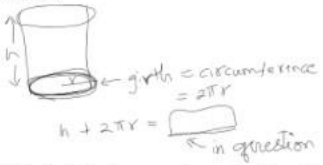
v'(x)=12x(14-x)=0 => x=14

x=14, L=28

Dimensions= 28 by 14 by 14

Max volume = 5488in^3

Part (b):



Solve for h in above equation and set it aside

Volume V = Π * r^2 * h

84=h+2(3.14)r => h=84-2(3.14)r

v(r)=(3.14)r^2h => 84r^2-2(3.14)^3r^3

v'(r)=6(3.14)r(28-(3.14)r)=0

Critical value = 28/3.14

Height = 28

V=(3.14)(28/(3.14)^2 (28) =6988in^3

Google slides, example of student work (continued):

Part A: The dimensions of the rectangular box are 18,18,36 In.

The maximum volume is $11,664in^3$. <- $V(x) = lx^2$

"X are the sides"

$V(x) = lx^2$

$= (108 - 4x)x^2$

$= 108x^2 - 4x^3$

$V(18) = 108(18)^2 - 4(18)^3$

$= 11,664in^3$

"L are the length"

$108 = L + 4x$

$108 - 4x = L$ <- $(x = 18)$

$108 - 4(18) = L$

$36 = L$

$V'(x) = 108x^2 - 4x^3$

$= 216x - 12x^2$

$V'(x) = 0$ -> *Critical value*

$216x - 12x^2 = 0$

$12x(18 - x) = 0$

$x = 18$

Part B: The radius of the cylinder is 36/π In.

The height of the cylinder is 36 in.

The maximum volume is $14,851in^3$. <- $V(r) = \pi r^2 h$

"R be the radius"

$V(r) = \pi r^2 h$

$= \pi r^2(108 - 2\pi r)$

$= 108\pi r^2 - 2\pi^2 r^3$

$V(36/\pi) = 108\pi(36/\pi)^2 - 2\pi^2(36/\pi)^3$

$= 14,851in^3$

"H are the height"

$108 = h + 2\pi r$

$108 - 2\pi r = h$

$108 - 2\pi(36/\pi) = h$

$36 = h$

$V'(r) = 108\pi r^2 - 2\pi^2 r^3$

$= 216\pi r - 6\pi^2 r^2$

$V'(x) = 0$ -> *Critical value*

$216\pi r - 6\pi^2 r^2 = 0$

$6\pi r(36 - \pi r) = 0$

$r = 36/\pi$

STRATEGY STEP#3
MODIFIED ASSESSMENT STRATEGY

Pre-assessment ('What is')

- A pre-requisite skills check quiz is given at beginning of class session to differentiate lecture (does not affect course grade but used in comparative study in conjunction with post-assessment. Helps the instructor know *What is the student's current course knowledge.*)

During ('What would')

- Assessment during lecture using engaging techniques (does not count towards course grade. Instructor prepares and presents the material in a way that meets the student learning objectives. *What course content would the student be walking out of the classroom.*)

Post-assessment ('What have')

- Given at the end of lecture or module lecture to assess *what concepts the learners have retained and have the course outcomes been met.* (Counts towards course grade.)

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LESSONS LEARNT

The students would take post-topic quizzes after every new material lecture. Mini discussions about answers took much of class time.

The quizzes taken on online website involved minimal writing. The students were able to establish the rules to solve a variety of problems but lacked in understanding the purpose without any written prompts.

The first two tests in the course were taken with time limit with in-class zoom proctoring and the last test was assigned as take-home with an integrative writing assignment and a mini project.

The Final exam was cumulative and proctored.

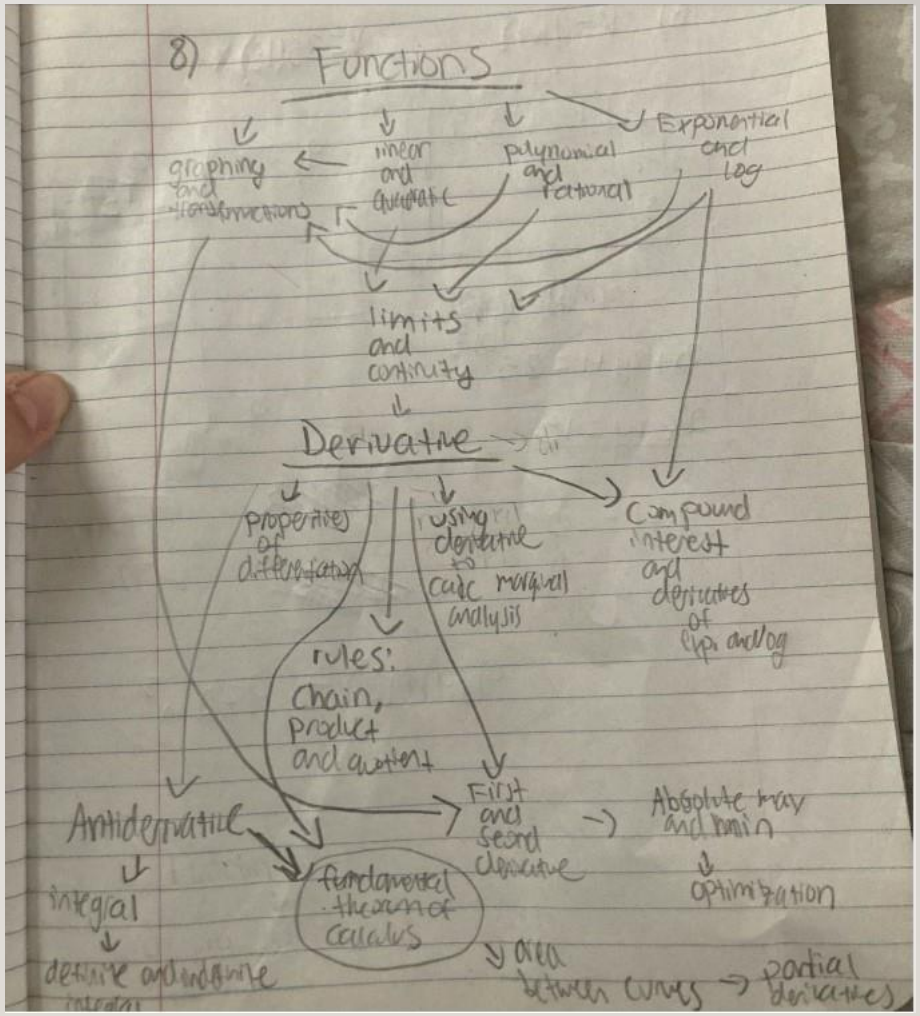
14 HOPE DESPITE TRIALS AND TRIBULATIONS…

Example: Writing prompt on Take-home test

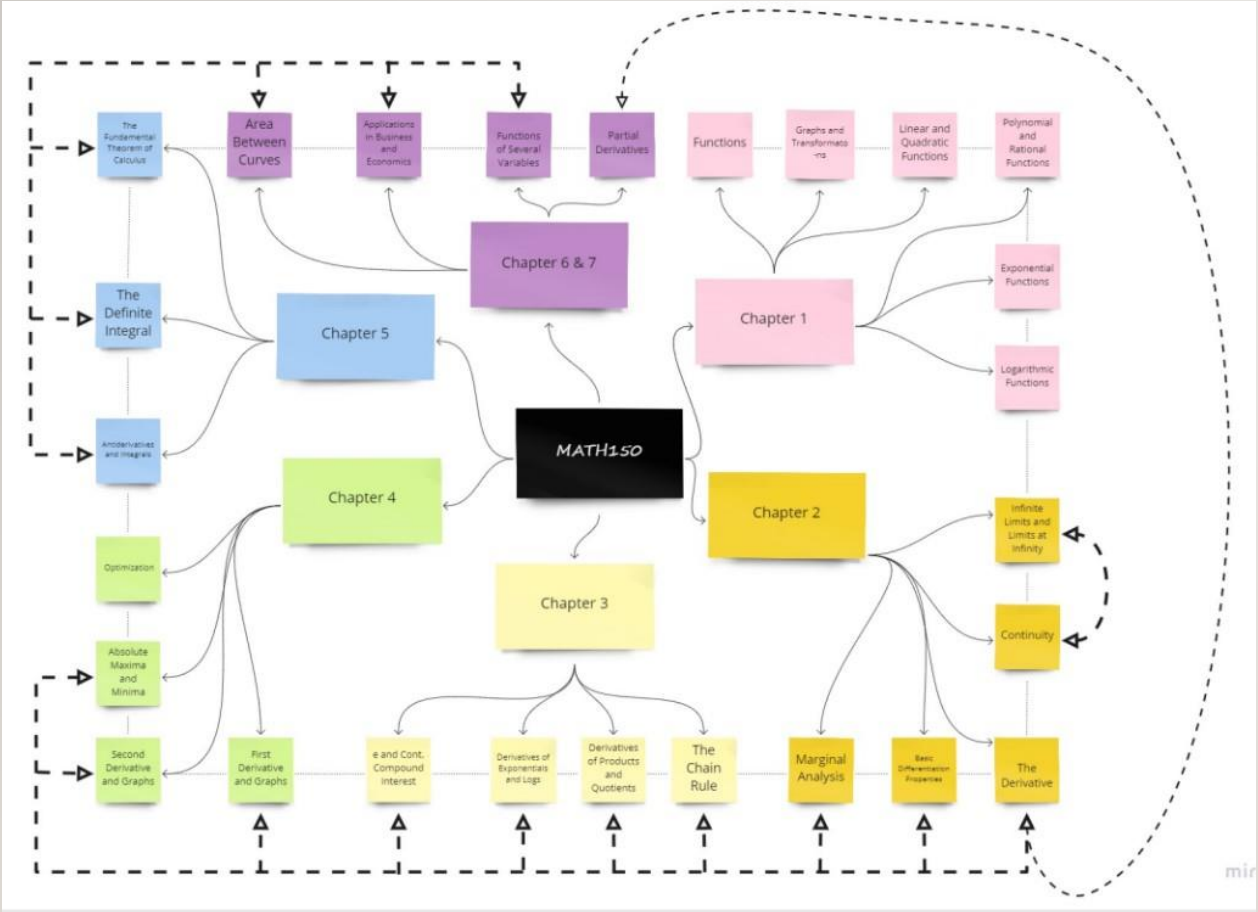
8) The last question on this document is part of Integrative writing learning assignment required as part of the course grade. Please read all instructions and submit your written work on separate sheet of papers.

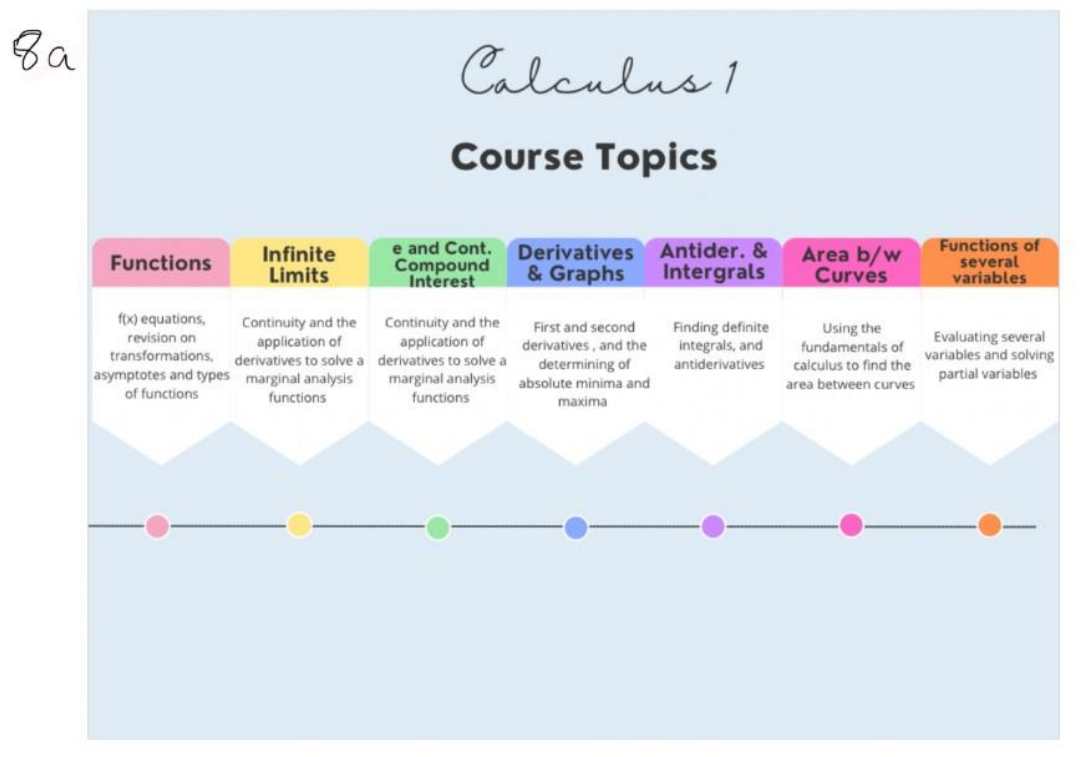
A) Use a flowchart or diagram or other models to illustrate the various topics discussed in the course so far and the sequence in which they were introduced all semester and if and how they are all connected using brief phrases. (Use of just topic title or headers is sufficient if it represents the topic well. No need to prepare an essay for this question. You may use pictures/flowchart/diagram/chart etc.) (10 pts)

Student Writing submissions Page #1

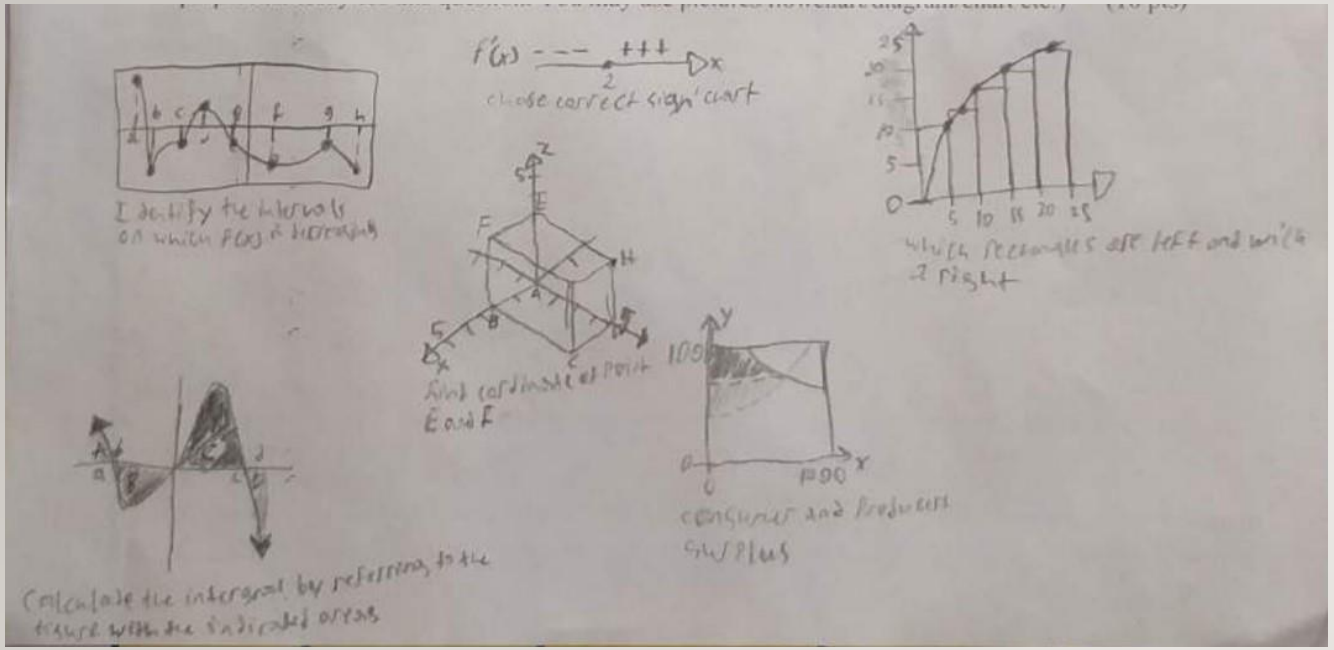


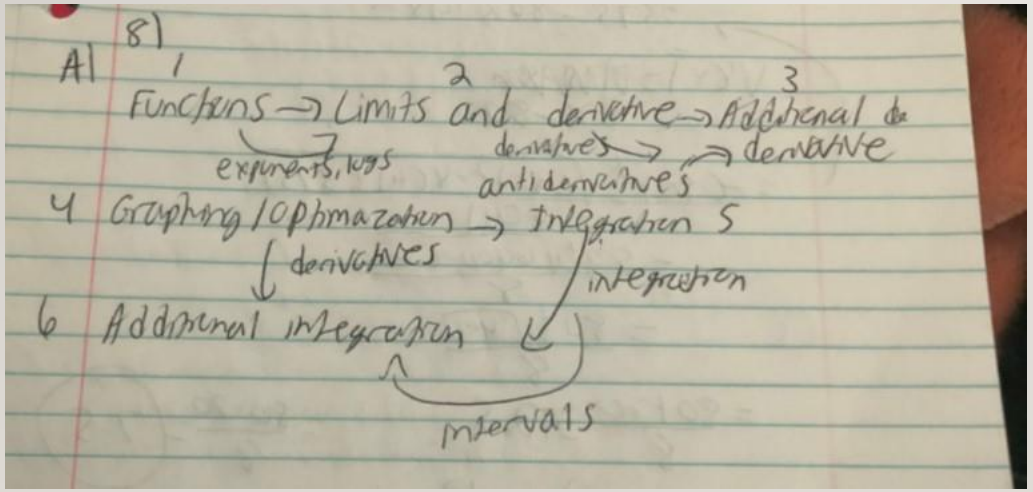
Student Writing submissions Page#2

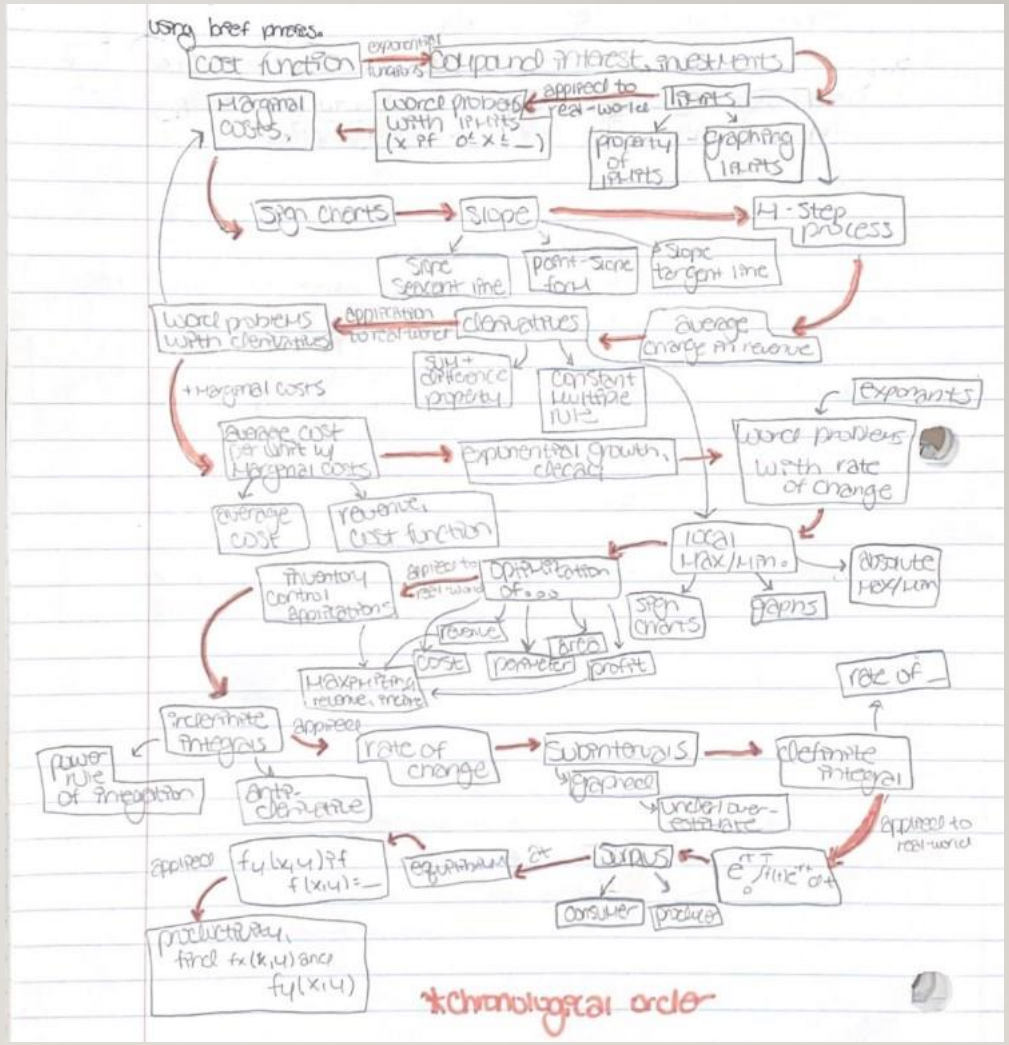




Student Writing submissions Page #3







Project on Take-home exam

B) Application problem: I came across this interesting exercise from a fellow math professor and modified it to suit our course assignment. This is a variation of the classic cardboard box problem we discussed in class and in homework. (20 pts)

You are asked to design a box from cardboard sheet of size: 15 inches wide by 25 inches long, by cutting and folding them as shown in the picture below.

The dark rectangles are the parts of the cardboard you'd cut away, and the light parts are the parts you'd keep. You would fold these along the dotted lines to make four sides, a bottom, a top, and flap to fold over and glue the top to the front of the box. The front flap (that is to be glued) needs to be 1 inch wide.

Well, the box you design can look wider on the ground or shallow and tall but it needs to hold maximum quantity inside it. So, what's the best way to slice up your cardboard (leaving that flap in the design)?

Student Project submissions

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8B) Call a as the width of the base

b as the length of the base

$V = a \cdot b \cdot x$ $\quad a = \frac{24 - 2x}{2} = 12 - x$

$b = 15 - 2x$

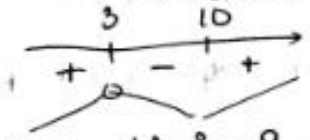
$V(x) = (12 - x)(15 - 2x)x$

$= (180 - 24x - 15x + 2x^2)x$

$= 180x - 39x^2 + 2x^3$

$V'(x) = 6x^2 - 78x + 180 = 0$

$\Rightarrow x = 10$ or $x = 3$

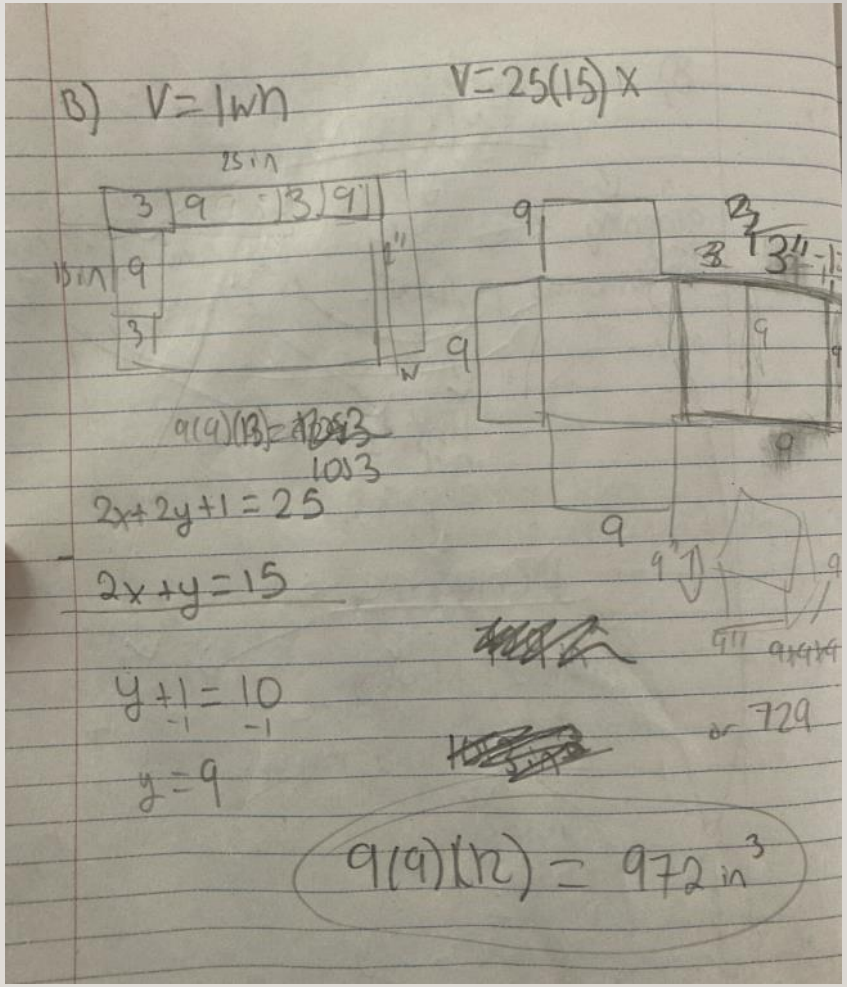


Local maximum at $x = 3$

$\Rightarrow a = 12 - 3 = 9$

$b = 15 - 2 \cdot 3 = 9$

To hold the maximum quantity inside, the box should be $9 \times 9 \times 3$ (inches)



NINE BOOKS WE HAVE READ IN 2021

- **February—*Teaching Effectively With Zoom* by Dan Levy**
- **March—*Creating Wicked Students* by Paul Hanstedt**
- **April—*Teach Students How To Learn: Strategies You Can Incorporate into Any Course to Improve Student Metacognition, Study Skills, and Motivation* by Saundra Yancy McGuire**
- **May—*The Miniature Guide to Critical Thinking* by Richard Paul and Linda Elder and Selections from *Classroom Assessment Techniques* by Thomas Angelo and Patricia Cross**
- **August- *How To Be an Antiracist* by Ibram Kendi**
- **September—*What the Best College Teachers Do* by Ken Bain**
- **October—*Student Engagement Techniques* 2nd ed. by Elizabeth Barkley and Claire Howell Major and excerpts from Paulo Freire's *Pedagogy of the Oppressed***
- **November—*Equity Centered, Trauma Informed Education* by Alex Shevrin Venet**
- **December—*Teaching Change: How To Develop Independent Thinkers Using Relationships, Resilience, and Reflection by Jose Antonio Bowen***

SELECT QUOTATIONS FROM THE ASSIGNED READINGS -

- ***Teaching Effectively With Zoom*, by Dan Levy**

Page 24: Principle 3 – Begin with the end in mind.

(The book talks about the three stages of this backward design pedagogy. It is important to keep this model in mind for the entire course as well as individual lesson plan you deliver each class. It has helped me stayed focused on my delivery content for the class session and gave my students the necessary (atleast just enough) information to work on assignments after the class.)

Page 21: Principle 2 – Plan for active learning

(I believe the appropriate active learning techniques help students stay more focused making the learning (& in turn the teaching) easy.)

- ***Creating Wicked Students: Designing Courses for a Complex World*, by Paul Hanstedt**

Page 87: Hanstedt writes: "Indeed, the more nonstandard our testing methods, the more necessary and ethical it is to make room in the course to allow students to practice ".

- ***Teaching Change: How To Develop Independent Thinkers Using Relationships, Resilience, and Reflection*, by Dr. Jose Antonio Bowen**

Part I, Chapter5: (Page 163) The Difficulty of Thinking with Others

The classroom diversity that we so strive for is a necessary but insufficient condition. It creates potential, but to realize it we will need to be much more intentional. Diversity is necessary for discussions to open minds, but without better structures and process, the divergent ideas in the room will mostly remain unheard.

(I find this quote interesting as this can not only be applied to a classroom setting but to any activity we work on, whether at or outside of work in teams or groups or committees. Open-mindedness is shown to increase learning through examination of past experiences, decisions and mistakes but also creates opportunities to involve in discussions about new ideas.)

SELECT QUOTATIONS FROM THE ASSIGNED READINGS (CONTINUED)

- ***What the Best College Teachers Do*, by Ken Bain**

Epilogue (Page 173): "To benefit from what the best teachers do, however, we must embrace a different model, one in which teaching occurs only when learning takes place."

(Bain emphasized throughout the book that the role of a teacher is not to merely teach material but to help students learn and understand. The main emphasis should remain that students acquire sufficient knowledge base about the discipline or course that includes concepts, factual content, and relevant procedures on which to build.)

Chapter 4 (Page 94): "The teachers we studied all shared this view that learning takes place not when students perform well on examinations but when they evaluate how they think and behave well beyond the classroom."

(As someone who teaches pre-requisite and introductory math courses in the course, I couldn't agree more with this statement. Students in these lower-level classes are expected to master the foundations in the discipline to be able to apply the knowledge and skills learned in the next higher level math classes and even beyond these classes and the degrees to their careers in some cases. And instructors must make these expectations clear to students from day 1 of the course. It is equally important to give students ample opportunity to apply their learning to thoughtful situations to develop their critical and problem-solving skills.

STUDENT ASSESSMENT SCORES

		Max 100	Max 100	Max 100	Out of 100%	Max 100
	Student	**Test1**	**Test2**	**Tests**	**HWsQs**	**Final**
	Name				**Average**	**Exam**
1	[redacted]	15	50	32.5	78.6	**72**
2	[redacted]	45	80	80	79.7	**65**
3	[redacted]	25	50	37.5	88.3	26
4	[redacted]	95	75	85	77.5	**72**
5	[redacted]	83	98	104	100.7	**90**
6	[redacted]	40	70	67.5	98.6	42
7	[redacted]	27	45	43.5	102.7	35
8	[redacted]	11	10	10.5	59.7	25
9	[redacted]	40	84	74	95.1	**82**
10	[redacted]	90	90	100	105.5	**97**
11	[redacted]	30	75	64.5	99	**68**
12	[redacted]	51	92	86	101.5	**96**
13	[redacted]	95	86	90.5	95.9	**94**
14	[redacted]	15	25	20	42.4	0
15	[redacted]	30	0	15	65	0
16	[redacted]	10	10	10	65.6	30
17	[redacted]	0	50	25	44.7	20
18	[redacted]	30	15	22.5	94.8	25
19	[redacted]	60	75	81.5	84.2	60
20	[redacted]	50	50	67.5	94.6	35
	Averages ->	44.3	59.5		76.1	60.8

STUDENT FEEDBACK

1 - The instructor provides clearly stated outcomes on the syllabus or other documents.

Sirisha Kolluru

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Strongly Agree	(4)	1	16.67%		3.17
Agree	(3)	5	83.33%		
Disagree	(2)	0	0.00%		
Strongly Disagree	(1)	0	0.00%		
Not Applicable	(0)	0	0.00%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
6/20 (30.00%)	3.17	0.41	3.00

8 - The instructor fosters an inclusive, respectful learning environment and acknowledges student diversity.

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Response Option	Weight	Frequency	Percent	Percent Responses	Means
Strongly Agree	(4)	4	66.67%		3.67
Agree	(3)	2	33.33%		
Disagree	(2)	0	0.00%		
Strongly Disagree	(1)	0	0.00%		
Not Applicable	(0)	0	0.00%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
6/20 (30.00%)	3.67	0.52	4.00

5 - The assessment tools (quizzes, projects, exams) cover the material taught.

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Response Option	Weight	Frequency	Percent	Percent Responses	Means
Strongly Agree	(4)	1	16.67%		3.17
Agree	(3)	5	83.33%		
Disagree	(2)	0	0.00%		
Strongly Disagree	(1)	0	0.00%		
Not Applicable	(0)	0	0.00%		

0 25 50 100 Question

Response Rate	Mean	STD	Median
6/20 (30.00%)	3.17	0.41	3.00

COURSE IMPROVEMENTS FOR NEXT TIME

- Collect frequent feedback from students for course improvements
- Research, collect and share OER resources with visual interpretations of the concepts.
- Make necessary revisions to the course content to suit course delivery modes: on-campus setting or hybrid or DL.
- Test if there is any correlation between student retention levels and well spaced-out assessments and increasing the study / test intervals.

And hope for no last-minute course changes or assignments ☺

4 - The instructor presents the material in an organized manner.

Sirisha Kolluru

Response Option	Weight	Frequency	Percent	Percent Responses	Means
Strongly Agree	(4)	1	16.67%		
Agree	(3)	4	66.67%		3.00
Disagree	(2)	1	16.67%		
Strongly Disagree	(1)	0	0.00%		
Not Applicable	(0)	0	0.00%		
				0 25 50 100	Question

Response Rate	Mean	STD	Median
6/20 (30.00%)	3.00	0.63	3.00

A BEAUTIFUL YEAR LONG JOURNEY

- **Pandemic, Quarantine, Stay-at-home, Remote teaching, Masks, Vaccines…….A whole year has gone by in the blink of an eye but not without teaching some valuable lessons to use for years to come. The SET experience has taught me that the more I experiment with my teaching, the more I learn about my students. Their feedback helps me create a better version of the course for next time.**

- SET has been one of the most engaging and effective professional development programs I have been involved with. It's structured professional learning helps instructors learn more about their student learning and results in changes in teacher practices that contribute to improvements in student learning outcomes. The year long journey took us around the country and world and across diverse disciplines. Hearing from my fellow colleagues helped me explore other pedagogical practices and overcome my fear of failure in experimenting in classroom.

Thank you so much for the wonderful opportunity.