Running a Discussion Section: Part II

UC San Diego

Announcements

- Have you contacted your course's instructor? What about the grader? Reserved a homework box?
- Obtain textbook for your course from the 7th floor front desk.
- Optional section for Math 500 on Tuesday, Oct. 8, 11-12 in APM 5402. Topic: Boardwork and breaking down problems into steps.
- Enroll in the Gradescope course for Math 500 using the code **97BD4J**.

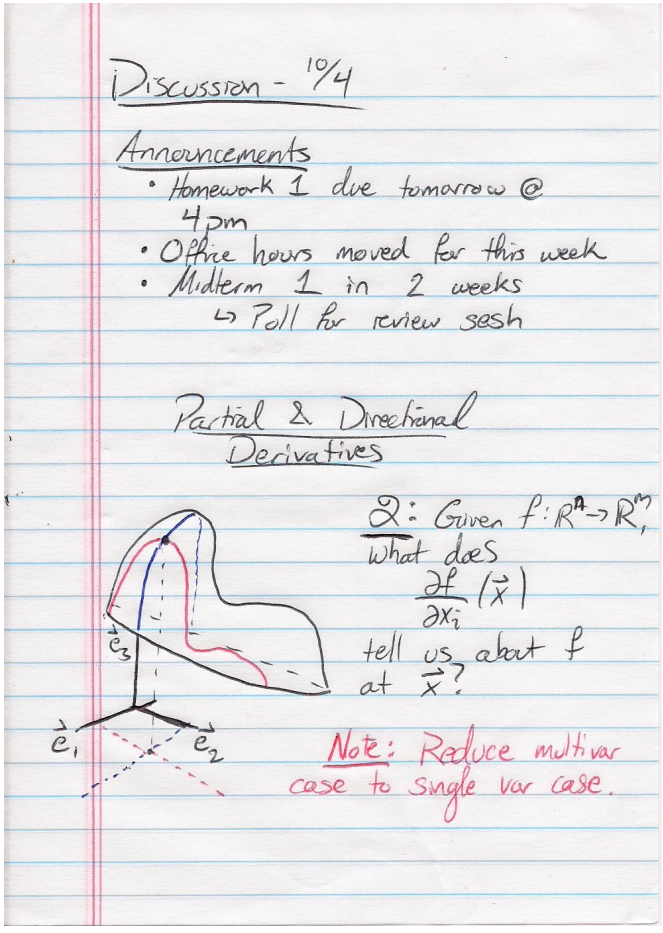
Homework

HOMEWORK: Write a teaching statement.

- 1 page, margins at most 1 inch, no larger than 12pt font
- Check out course web-page for examples and suggestions. Don't just copy this! Make your teaching statement your own!
- Submit by uploading a pdf to Gradescope by **Friday, Oct. 11 at 11:59pm**.
- Please enroll in Gradescope this week. Do not leave any Gradescope issues to the last minute.

What to do 2-3 Days Before Section

- Review with instructor/consult syllabus for what was/will be covered.



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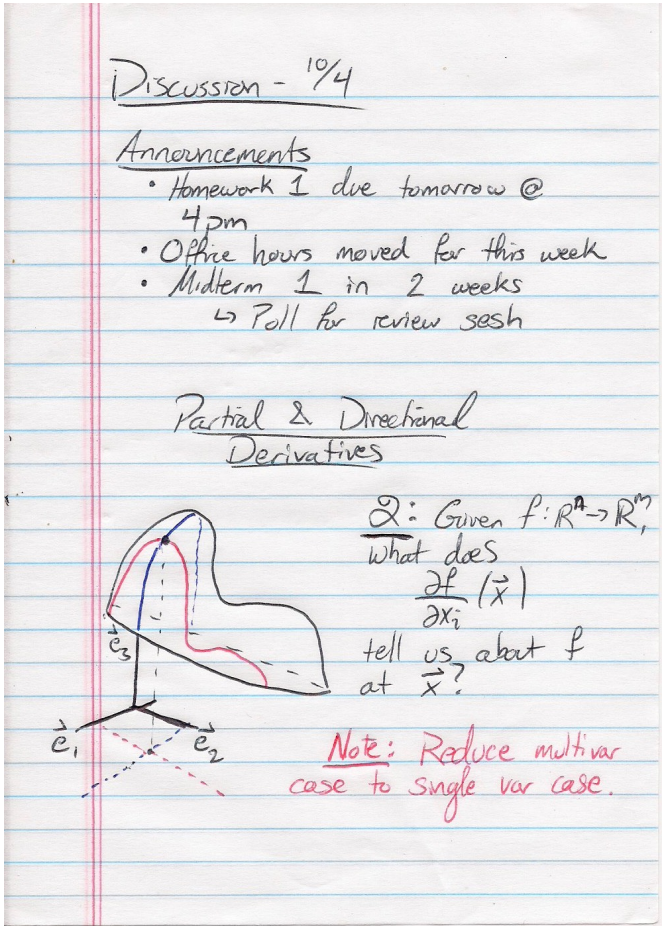

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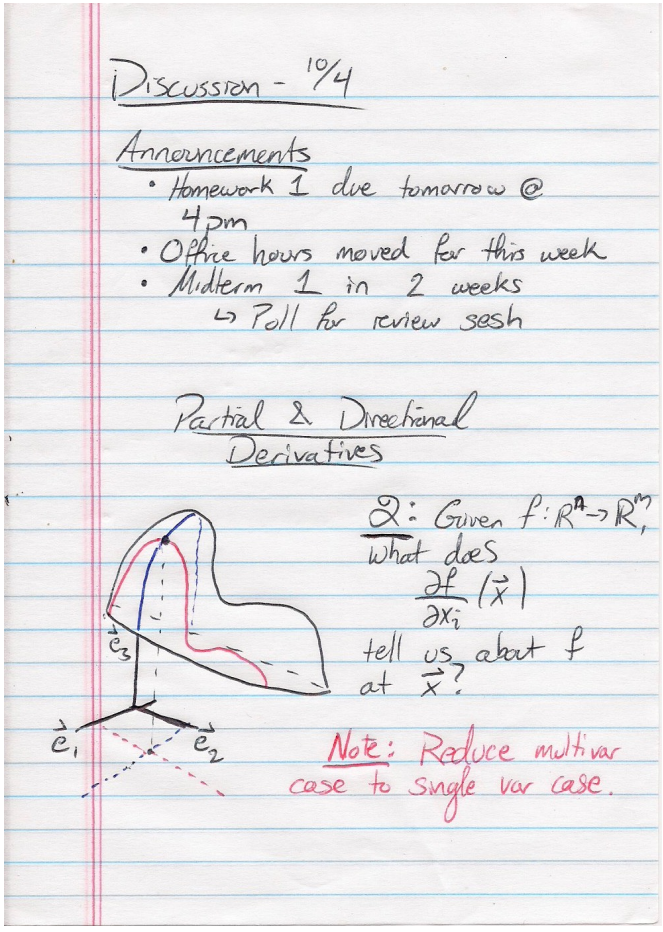
- Identify key ideas/concepts. Plan to reinforce these. Brainstorm potential student misconceptions.



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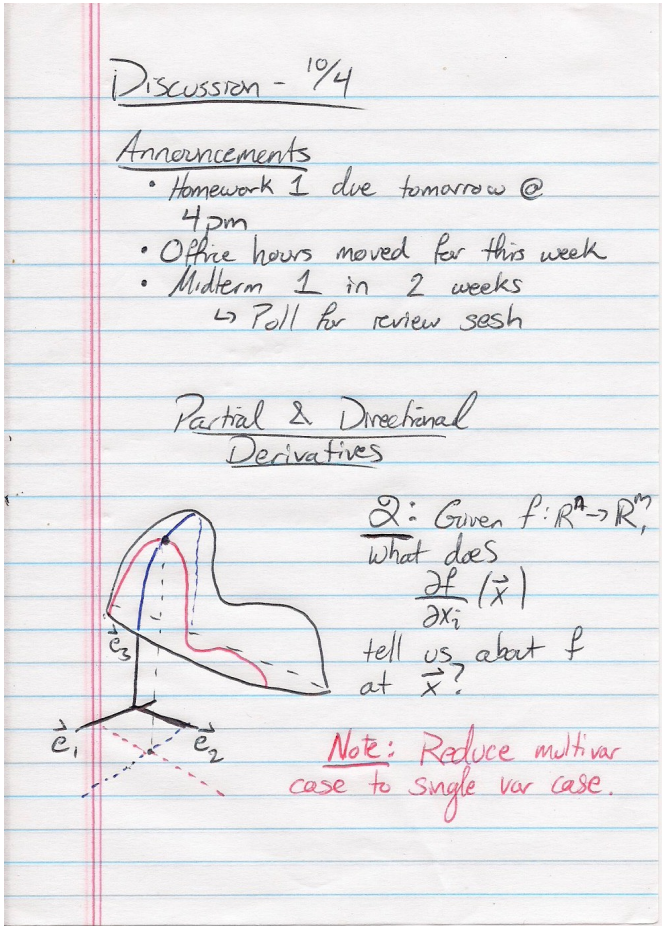
- Review all homework excercises.
- Identify key ideas/concepts. Plan to reinforce these. Brainstorm potential student misconceptions.
- Prepare a brief review, 2 or 3 questions in case of lull.



Finishing on Time

- Do not keep students long past the when discussion is over. Students do not appreciate this.
- Keep in mind that not every question will be answered during discussion.
- If a discussion is threatening to run long, end with a carefully given hint or a well-posed question.
- Encourage students to come to office hours.

What Can I Expect My Students to Know?

- Know which courses are prerequisites (and which are not!). Assume students have seen that material, but may not have mastered it.
- If there are no UCSD prerequisites, keep in mind that students:
  - have likely never seen proofs or mathematical logic before
  - are uncomfortable with abstract reasoning and prefer computational examples
  - may struggle with basic algebraic manipulations
- Do not assume that any material covered in the course is review for students, even if you saw it in high school.

Where Do Students Commonly Struggle?

- Often do not understand the importance of knowing precise mathematical definitions
- May not fully understand logical statements, including statements of theorems
  - in particular, they do not understand that if the assumptions of an implication are not satisfied, the statement is still true
  - often cannot interpret what reaching a contradiction means
- Have difficulty recognizing when they are done with a problem, and do not check their answer
- Do not know examples or counterexamples to use as a "sanity check"

Prof. Rabin's Three Rules of Teaching

1. Everything should be made as simple as possible, but not simpler than that. (–Einstein?)

2. Be enthusiastic about what you are teaching. If you aren't, why would your students be?

3. Hear what you say, see what you write, from students' viewpoint. Would I understand it without the background I have now? What am I assuming without explaining it? Terminology, strategies, context. Use your own undergraduate experience to help you.

Problem Solving, Phase 1: Understanding the Problem

- What do the words in the problem mean?
- What is the situation described? Can I draw a picture?
- What is given and what must be found/proved/done?
- How will I tell when I have found it?
- Do I know an example?
- Do I know a relevant theorem?
- What is my conjecture/prediction of the answer?

Problem-free Activity

- Students may not be engaged with a **mathematical** problem at all, but rather a social one.
- “What do they want me to do?", instead of "what does this mean?"
- They may perform rote procedures in response to perceived triggers.
- “The problem" becomes guessing what is expected, or forcing the situation to fit a known template.

Problem Solving, Phase N+1: Reflection

- How would I recognize such a problem on an exam?
- Why was this problem assigned?
- Can the answer be checked? What does it mean? Does it make sense? Could I have anticipated it?
- How does the answer change if parameters or assumptions vary?
- Are there alternate solution methods?
- What patterns or new questions does the solution suggest?

TA Questions

- "What's the next step?" may not be ideal.
- What does this mean?
- How do we know this?
- What does this computation prove? (Necessary or sufficient condition? For all, or there exists?)
- Is there another way? What would happen if we did this?
- What is the role of this concept (e.g. continuity) in the solution?
- How can we check the answer?
- What if we modify the problem by...?
- What was confusing, and how can we avoid this confusion next time?

An Example Problem

- How would you guide students through a related rates problem? What mistakes would you expect students might make?

- A light is on the top of a 12 foot pole and a 5 foot 6 inch person is walking away from the pole at a rate of 2 feet per second. At what rate is the tip of the shadow moving away from the pole when the person is 25 feet from the pole?

An Example Problem cont.

- Draw a picture!

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- Translate the word problem into useful equations
- Help them understand what quantity they are trying to compute
- What would happen if we plugged in the number 25ft before differentiating instead of after?
- What does a reasonable answer look like?