

## **Exam 2 Information and Review (all times Grinnell Time)**

The exam is Thursday, February 25. The exam will cover the content in 14.1 & 15.1-15.6.

You need to be on Zoom by 10:00 AM that day and can leave Zoom whenever you are done. I will be on by 9:45 AM. The exam is 75 minutes.

You can mute and turn off your video for Zoom during the exam. If there is a typo or clarification during the exam, I will say it out loud on Zoom and type it in chat, so check chat occasionally. If you have a question during the exam, you can type it to me privately in chat and I will try to respond that way. If we need to chat briefly, we can do so in a Breakout Session.

**Besides pencil and paper (or a tablet if you write your homeworks on one) you may only use the textbook (physical version or pdf) and a basic scientific calculator, not notes, nor other webpages, nor friends, nor graphing calculators.**

You will download the exam questions from Gradescope just like on the Quizzes. They will release at 9:58 AM.

You will write your solutions on your own paper. Please write as neatly as you reasonably can and let me know clearly which problem is which. You should also include scratch work you want me to grade but, again, clearly mark your solutions. You will have to scan the file somehow (see the syllabus for suggestions) and be finished by 11:15 AM. There is a 5 minute grace period to deal with technology, but you **MUST** email me by 11:15 AM if you have issues to let me know you need the extra minutes.

Here's what the top of the exam will say: Please read all the problem instructions carefully. Show your work. **No work = No points.** Problems with no justification will get no credit. You may use the book but no notes nor worked problems nor online resources nor graphing calculators. Leave fractions or roots as is in your answer.

**If you run into any technical issues during the exam, email me right away.**

## **Book Practice Problems**

- pg. 885 **Concept Check:** 1, 2
- pg. 886-887 **Exercises:** 1, 2c, 3, 6a
- pg. 980 **Concept Check:** 1a, 2a, 5, 6, 7a, 8, 11, 13-14

- pg. 981-983 **Exercises:** 1-4, 7,8 but instead of "sketch", make some educated guesses about what the shape should be like and compare it to Maple outputs. 5-6, 11, 13-24, 25-29 part (a) only for these, 35-38, 43-48

## Suggestions

- Work lots and lots of problems, especially those on material you don't understand as well.
- When possible, ask yourself WHY you are solving a problem a certain way or WHY the result is true.
- Do not look at solutions unless you are desperate.
- Check your work!!

## Sample Problems

1. Find equations for the tangent line to the curve  $\mathbf{r}(t) = \left\langle 4 - t^3, e^{-t}, \frac{1}{t+1} \right\rangle$  at  $t = 3$ .
2. Given the parametric equations  $x = t^2 - 9$  and  $y = t^2 - 8t$ 
  - (a) Find where the tangent is horizontal or vertical.
  - (b) Find the equation of the tangent line at  $t = 4$ .
3. Compute all the first and second partial derivatives of the following functions.
  - (a)  $f(x, y) = x \ln(x^2 y) - 3y$
  - (b)  $f(x, y) = e^{\sqrt{x^2 + y^2}}$
4. Compute the gradient for the function  $f(x, y) = \cos(x^2 + y)$ .
5. Find an equation of the tangent plane of the function  $f(x, y) = \frac{x}{\sqrt{y}}$  at  $(4, 4)$ .
6. (a) Use the chain rule to find  $\frac{df}{dt}$  when  $f(x, y) = \ln x + \ln y$ ,  $x = \cos t$ , and  $y = t^2$ .  
 (b) Use the chain rule to find  $\frac{\partial f}{\partial s}$  and  $\frac{\partial f}{\partial t}$  where  $f(x, y) = x^2 + \sin(xy)$ ,  $x = e^{s+t}$ , and  $y = s + t$ .
7. (a) Find the directional derivative of  $f(x, y) = x^2 + 4y^2$  at the point  $(3, 4)$  in the direction pointing toward the origin.  
 (b) Is this function increasing or decreasing at the point  $(3, 4)$  in the direction pointing toward the origin?
8. Find the linearization  $L(x, y)$  of  $f(x, y) = x^2 y^3$  at the point  $(2, 1)$ .