Fall 2021 MATH241 Discussion

This document can be found on my website, named as "Discussion notes". If needed, I will update further information in the same document.

Time & location

- Section BDH: TR 2-3pm, 441 Altgeld.
- Section BDI: TR 3-4pm, 441 Altgeld.

Contact

- Email: xinran4@illinois.edu. Please included MATH241 and your section number in your email subject. If you don't get a reply in two days, feel free to send me a reminder.
- **Any math question should be post on Campuswire** because it can be answered much quicker than email and we TAs can type math symbols on Campuswire.
- Office hour: Wed 4-6pm on Zoom.[1]

Covid related

- **Face mask is required** all the time during discussion.
- Face shield is in general not acceptable unless one holds a DRES accommodation letter.[2]
- **According to university policy, student who does not wear a proper face covering will be asked to put on one or to leave the class room.**
- **If the student refuse to leave, I'll have to dismiss the class and report this to the undergraduate office.**
- In the case one tested positive, status can be checked by your instructor. I'll have to verify it before giving any excuse of being absent due to covid.[3]

Worksheet

- I will print copies and bring it to the classroom.
- You'll find group number written at the up right corner.
- If you prefer to work on a electronic version, you can find the worksheets on Moodle under "Worksheets" folder.
- The worksheets are long and you might not be able to finish them in calss, so you don't have to write down every single step.
- **Solutions will be avaliable on Moodle at 5pm** after discussion sections are done.
- Ask for hints when you get stuck on a problem.

[1] Office hour is run for all students in MATH241, regardless of section.
[2] See accommodation below for more information.
[3] Also see the grading section below.

Grading

- **Attendance is required** in order to get full grade for discussion.
- You shouldn't come to the class if you are sick.
- **The lowest 4 scores will be dropped** in order to remediate unforeseen illness, change of location or any possible reason for missing a class.
- If you were ill for more than 4 classes and want to see if you could be excused from that, you'll need to provide documents such as DRES letter to your instructor.
- Worksheets will be graded in a scale of 0-5. They are **not** graded for correctness.
- Most likely you'll get a full mark. In case you are interested, here is a sample grading scale:

  5 Most likely you'll get a full mark

  4 Being late or leave early for 15 min

  3 Being late or leave early for 25 min

  2 Being late or leave early for 35 min

  1 Not doing anything at all during the class

  0 Not showing up for any reason.

Accommodation

- Please contact the Disability Resources & Educational Services (DRES), if you need any sort of accommodation.
- You'll need to email **both your instructor and me** once you get the accommodation letter.

Contents

Worksheet 1

Chain rule

If $h(x) = g \circ f(x)$, then

$$h'(x) = g'(f(x)) \cdot f'(x).$$

Arc length of parameterized curve

Given a parameterized curve $(x(t), y(t))$, then the arc length between $(x(a), y(a))$ and $(x(b), y(b))$ is

$$s = \int_a^b \sqrt{\left(\frac{\mathrm{d}x}{\mathrm{d}t}\right)^2 + \left(\frac{\mathrm{d}y}{\mathrm{d}t}\right)^2}\,\mathrm{d}t.$$

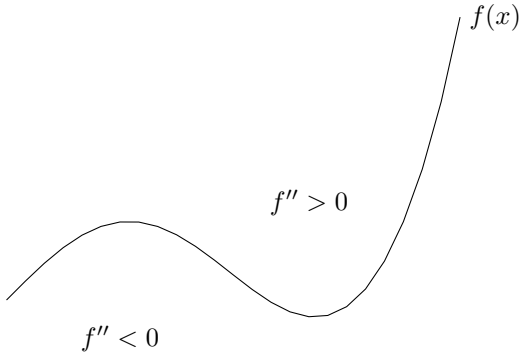
First and second derivative tests

We use the first and second derivative tests to determine local minimum and maximum.

First derivative tests. Compute $f'(x) = 0$ to find critical points.

Second derivative tests.

- If $f''(x) > 0$ for all x in the interval, then f is concave upward $\implies$ local minimum.
- If $f''(x) < 0$ for all x in the interval, then f is concave downward $\implies$ local maximum.



Taylor series

$$\begin{aligned} f(x) &= \sum_{n=0}^{\infty} \frac{f^{(n)}(a)}{n!}(x-a)^n \\ &= f(a) + f'(a)(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \frac{f'''(a)}{3!}(x-a)^3 + \cdots \end{aligned}$$

Substitution rule/Change of variable

Let $u = g(x)$, then

$$\int f(g(x)) \cdot g'(x)\,\mathrm{d}x = \int f(u)\,\mathrm{d}u.$$