# Spring 2021 MATH231 Section CDQ Discussion

WF 9-10am
This document can be found here.

## Contact

- TA for section CDQ: Xinran Yu
- Email: xinran4@illinois.edu. Please included MATH231 in email subject.
- Office hour: Wed 10-11am[1]

## Zoom

- Please use your cameras and microphones during group discussion, especially in breakout rooms.
- If you have any question, you can always interrupt me/using the "raise hand" feature on Zoom.
- You can call me into your breakout room/return to the main room to ask for help.
- It is also possible for me to join your breakout rooms randomly to check if you have any questions.

## Worksheet

- Worksheet can be found on Moodle under Groupwork folder.

## Submission

- Submit on Moodle under Groupwork folder.
- **1 submission per group**.[2]
- Group remains the same until each midterm
- 1st worksheet of the week is due on **Thursday** at **8AM** CST. [3]
- 2nd worksheet of the week is due on **Saturday** at **8AM** CST.
- Worksheet solutions available at 12:30PM CST on the due date.

[1] Office hour is run for all students in MATH231
[2] Groups are assigned randomly by Moodle
[3] Central Standard Time

# Contents

# 1 Week 1 Wed

Recall

**Theorem 1.1** (Fundamental Theorem of Calculus)**.** *Ref p.26*

*Part 1* *If $f(x)$ is **continuous** over an interval $[a, b]$, and the function $F(x)$ is defined by*

$$F(x) = \int_a^x f(t)\,\mathrm{d}t, \quad x \in [a, b]$$

*then $F'(x) = f(x)$ over $[a, b]$.*

*Part 2* *If $f(x)$ is **continuous** over an interval $[a, b]$, and $F(x)$ is any antiderivative of $f(x)$ i.e. $F'(x) = f(x)$, then*

$$\int_a^b f(x)\,\mathrm{d}x = F(a) - F(b).$$

**Example 1.2.**

$$g(x) = \int_a^{b(x)} f(t)\,\mathrm{d}t$$

Apply chain rule and FTC

$$g(x) = \frac{\mathrm{d}}{\mathrm{d}x}\int_c^{b(x)} f(t)\,\mathrm{d}t = b'(x)\,f(b(x))$$

## 2 Week 1 Fri

Recall

- $$\frac{d}{dx}\arctan(x) = \frac{1}{1+x^2}$$
- If $u = x + C$,
$$\mathrm{d}u = \frac{\mathrm{d}u}{\mathrm{d}x}\,\mathrm{d}x = 1 \cdot \mathrm{d}x.$$
- Change of variable, let $u = g(x)$, then
$$\int_a^b f(g(x))g'(x)\,\mathrm{d}x = \int_c^d f(u)\,\mathrm{d}u.$$

## 3 Week 2 Wed

Recall the area between $g(x)$ and $f(x)$ is

$$\int_a^b g(x) - f(x)\,\mathrm{d}x.$$