

Spring 2021 MATH231 Section CDQ Discussion

WF 9-10am

This document can be found on [my website](#).

Contact

- TA for section CDQ: Xinran Yu
- Email: xinran4@illinois.edu
- Office hour: Wed 10-11am

Format

- 20 min group working in break out rooms
- 20 min working out examples in main room

Worksheets

- Should be submitted to Moodle
- 1 submission per group¹
- Groups remain the same until each midterm
- 1st worksheet due on **Thursday** at **8AM** CST²
- 2nd worksheet due on **Saturday** at **8AM** CST

¹Groups are assigned randomly by Moodle

²Central Standard Time

Contents

1	Week 1 Wed	3
2	Week 1 Fri	4
3	Week 2 Wed	4

1 Week 1 Wed

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*

$$F(x) = \int_a^x f(t) \, dt, \quad x \in [a, b]$$

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*

$$\int_a^b f(x) \, dx = F(b) - F(a).$$

Example 1.2.

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

Apply chain rule and FTC

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

2 Week 1 Fri

Recall

-

$$\frac{d}{dx} \arctan(x) = \frac{1}{1+x^2}$$

- If $u = x + C$,

$$du = \frac{du}{dx} dx = 1 \cdot dx.$$

- Change of variable, let $u = g(x)$, then

$$\int_a^b f(g(x))g'(x) dx = \int_c^d f(u) du.$$

3 Week 2 Wed

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

$$\int_a^b g(x) - f(x) dx.$$