

DISCUSSION 1

Bin Dai

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1 TA Information

- **TA:** Bin Dai
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- **OFFICE HOURS:** Mon 1-3PM
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2 Discussions

- I will answer questions concerning course materials, solutions to homework shown upon request.
- Since homework due on Thursday, so possible hint for current homework may be provided.
- Discussion time:
 - **311:** Wed 8:50AM-9:40AM, VAN HISE 240
 - **312:** Wed 12:05PM-12:55PM, VAN VLECK B313
 - **313:** Tue 1:20PM-2:10PM, SOC SCI 5322
- Content of these three discussions are the same so you only have to take once a week, but your homework will be returned on the discussion you denoted on your homework.

3 Homework

1. **Collection** Homework will be collected in lecture on every Thursday. Late submission will **NOT** be graded.
2. **Returning** I will return the homework to you in the discussions the following week.
3. **Formatting** PRINT your NAME and DISCUSSION NUMBER on the upper-right corner of the first page, failure to do so will cause no grading or no return. Multiple pages shall be stapled.
4. **Policies**
 - Show all your work. Final answer without showing process cannot get point.
 - Grading will be 10 points scale regardless of the number of the homework.
 - Discussion among the students is highly encouraged, but plagiarism will be prohibited.

4 Calculus Review

4.1 Integral

4.1.1 Riemann Integral(Fundamental theorem of Calculus)

$$F(x) = \int_a^x f(t)dt$$
$$\int_a^b f(t)dt = F(b) - F(a)$$

4.1.2 Property(Linearity)

$$\int_a^b (\alpha f + \beta g)(x)dx = \alpha \int_a^b f(x)dx + \beta \int_a^b g(x)dx$$

4.1.3 Integration by Part

$$\int_a^b f(x)g'(x)dx = f(x)g(x)|_a^b - \int_a^b g(x)f'(x)dx$$

4.1.4 Improper Integrals

- If the interval is unbounded, for instance at its upper end, then the improper integral is the limit as that endpoint goes to infinity.

$$\int_a^\infty f(x)dx = \lim_{b \rightarrow \infty} \int_a^b f(x)dx$$

- If the integrand is only defined or finite on a half-open interval, for instance $(a, b]$, then again a limit may provide a finite result.

$$\int_a^b f(x)dx = \lim_{\varepsilon \rightarrow 0} \int_{a+\varepsilon}^b f(x)dx$$

4.2 Multiple Integration

4.3 L'Hôpital's Rule

If $\lim_{x \rightarrow c} f(x) = \lim_{x \rightarrow c} g(x) = 0$, or $\lim_{x \rightarrow c} f(x) = \lim_{x \rightarrow c} g(x) = \pm\infty$, then

$$\lim_{x \rightarrow c} \frac{f(x)}{g(x)} = \lim_{x \rightarrow c} \frac{f'(x)}{g'(x)}$$

4.4 Extreme Values

- **Fermat's Theorem** Let $f : (a, b) \rightarrow R$ be a function and suppose that $x_0 \in (a, b)$ is a local extremum of f . If f is differentiable at x_0 then $f'(x_0) = 0$ (maximum if $f''(x_0) < 0$, minimum if $f''(x_0) > 0$).