Midterm 1 Calendar

Monday	Tuesday	Wednesday	Thursday	Friday
1/13 Syllabus Review of Calc I	1/14 5.5 - Change of Variables (u-Substitution)	1/15 7.1 - Integration by Parts WebAssign - Review of Integration	1/16 P: Geometric Interpretation of u-sub HW1	1/17 7.1 - Integration by Parts Quiz 1 WebAssign - 5.5
1/20 MLK Day	1/21 7.2 - Trig Integrals WebAssign - 7.1	1/22 7.2 - Trig Integrals	1/23 P: Integral Sorting HW2	1/24 7.3 - Trig Sub Quiz 2 WebAssign - 7.2
1/27 7.3 - Trig Sub	1/28 7.4 - Partial Fractions WebAssign - 7.3	1/29 7.4 - Partial Fractions	1/31 P: Approximate Integration HW3	1/31 7.8 - Improper Integrals Quiz 3 WebAssign - 7.4
2/3 7.8 - Improper Integrals WebAssign - 7.7	2/4 6.1 - Area Between Curves 6.2 - Volumes of Solids with Known Cross Sections	2/5 6.2 - Volumes of Solids with Known Cross Sections WebAssign - 7.8	2/6 P: Solids with Known Cross Sections HW4	2/7 6.3 - Volumes by Shells Quiz 4 WebAssign - 6.1
2/10 Review Midterm 1 5:45pm-7:15pm	2/11	2/12	2/13	2/14

Assignments

Lecture	Projects	WebAssign	Homework	Quiz
Review of Calc I 5.5 - Change of Variables 7.1 - Integration by Parts 7.2 - Trig Integrals 7.3 - Trig Sub 7.4 - Partial Fractions 7.8 - Improper Integrals	Geometric Interpretation of u-sub Integral Sorting Approximate Integration	Review of Integration 5.5 7.1 7.2 7.3 7.4 7.7 7.8	Homework 1 Homework 2 Homework 3 Homework 4	Quiz 1 Quiz 2 Quiz 3 Quiz 4

Overview

5.5 - Change of Variables

- Simplifies integrals by making a substitution $u = g(x)$.
- Replace dx with du using $du = g'(x)dx$.
- Rewrite the integral in terms of u and solve.
- Key for transforming complicated integrals into simpler forms.

Example: Evaluate $\int xe^{x^2}dx$.

7.1 - Integration by Parts

- Used for integrals involving a product of functions.
- Formula: $\int u\,dv = uv - \int v\,du$.
- Choose u and dv wisely.
- Commonly used for logarithmic, exponential, and polynomial combinations.

Example: Evaluate $\int x \ln x\,dx$.

7.2 - Trigonometric Integrals

- Focuses on integrating powers of $\sin(x)$ and $\cos(x)$, or their combinations.
- Use identities such as:
  - $\sin^2(x) + \cos^2(x) = 1$.
  - $\sin^2(x) = \frac{1-\cos(2x)}{2}$, $\cos^2(x) = \frac{1+\cos(2x)}{2}$.
- For odd powers of $\sin(x)$ or $\cos(x)$, save one factor and simplify using identities.
- For even powers, use double-angle formulas.

Example: Evaluate $\int \sin^3(x)dx$.

7.3 - Trigonometric Substitution

- Substitutes trigonometric expressions for square roots in integrals.
- Key substitutions:
  - $\sqrt{a^2 - x^2} \to x = a\sin(\theta)$.
  - $\sqrt{a^2 + x^2} \to x = a\tan(\theta)$.
  - $\sqrt{x^2 - a^2} \to x = a\sec(\theta)$.
- Requires rewriting the integral and substituting back after evaluation.

Example: Evaluate $\int \frac{1}{\sqrt{4-x^2}}dx$.

7.4 - Partial Fractions

- Decomposes rational functions into simpler fractions for easier integration.
- Applies to proper fractions where the degree of the numerator is less than the denominator.
- Steps:
  - Factor the denominator into linear or irreducible quadratic factors.
  - Decompose into partial fractions.
  - Integrate each term individually.

Example: Evaluate $\int \frac{1}{x^2-1} dx$.

7.8 - Improper Integrals

- Handles integrals with:
  - Infinite limits: $\int_a^\infty f(x)dx$.
  - Discontinuities in the interval of integration.
- Evaluate using limits:
  - $\int_a^\infty f(x)dx = \lim_{b\to\infty} \int_a^b f(x)dx$.
  - $\int_a^c f(x)dx + \int_c^b f(x)dx$ for discontinuities at $x = c$.

Example: Evaluate $\int_1^\infty \frac{1}{x^2} dx$.