Math 231 Lecture 4

• Quiz 1 in sections tomorrow!

  1. Complete the quiz on your own. This will count for 80% of the quiz grade.
  2. Break into groups and complete the quiz as a group. This will count for 20% of the quiz grade.

Note: Your total score cannot be lower than your score on the first part.

• HW 4 due Friday 8:30am. No Preclass for next lecture.

• Midterm 1 in two weeks! Information about Midterm 1 added to wiki.

7.3 Trig Substitution

Goal: Find integrals containing \( \sqrt{a^2 - x^2} \), \( \sqrt{a^2 + x^2} \), \( \sqrt{x^2 - a^2} \) or similar.

Substitution rule in reverse:

\[
\int f(x) \, dx = \int f(g(\theta)) \, g'(\theta) \, d\theta
\]

Trig sub: \( g(\theta) \) will be a multiple of \( \sin \theta \), \( \cos \theta \), \( \tan \theta \), or \( \sec \theta \).

Example:

\[
\int \frac{1}{\sqrt{1 - x^2}} \, dx =
\]
1) Integrals containing $\sqrt{a^2 - x^2}$

sub: $[x = a \sin \theta]$

Ex 1: $\int \frac{x^2}{(9 - x^2)^{3/2}} \, dx$
2) Integrals containing $\sqrt{a^2 + x^2}$

sub: $x = a \tan \theta$

Ex 2: $\int \frac{1}{\sqrt{x^2 + 4}} \, dx$

Ex 3: $\int \frac{x^3}{\sqrt{1 + x^2}} \, dx$
3) Integrals containing $\sqrt{x^2 - a^2}$

sub: $x = a \sec \theta$

Ex 4: $\int \frac{\sqrt{x^2 - 25}}{x} \, dx$
7.4 Partial Fractions

Goal: Evaluate $\int \frac{P(x)}{Q(x)} \, dx$.

Procedure:

1. If $\deg(P) \geq \deg(Q)$, perform long division.
2. Factor $Q$ completely.
3. Find partial fraction decomposition.
4. Evaluate easier integrals.