Math 426.2SY
Calculus II

University of New Hampshire

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Outline

Introduction

Main idea:

Replace integrals involving square roots with integrals involving trig functions.

We will focus on replacing the following kinds of square roots:

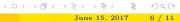$$\sqrt{x^2 + a^2}, \quad \sqrt{x^2 - a^2}, \quad \sqrt{a^2 - x^2}$$

Trig Substitution

- $\sqrt{x^2 + a^2}$

Trig Substitution

- $\sqrt{x^2 - a^2}$

Trig Substitution

- $\sqrt{a^2 - x^2}$

Trig Substitution

Example

$$\int \frac{dx}{\sqrt{4 + x^2}}$$

Trig Substitution

Example

$$\int \frac{x^2}{\sqrt{9 - x^2}} \, dx$$

Trig Substitution

Example

$$\int \frac{dx}{\sqrt{25x^2 - 4}}$$

Trig Substitution

- Keep in mind that not all integrals involving roots like these require trig substitution.
- The first technique to consider is regular substitution, as it typically requires less work.

Trig Substitution

Example

$$\int \frac{x}{\sqrt{9 - x^2}} \, dx$$