

# Math 123: Trig Integrals

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# Outline

## 1 Trig Integrals

# How do we integrate Trigonometric functions?

**Example:**  $\int \sin(x)dx$  and  $\int \cos(x)dx$ .

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For  $\int \cos^{odd}(x)dx$  or  $\int \sin^{odd}(x)dx$  use

$$\cos^2(x) + \sin^2(x) = 1$$

and u-substitution

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

For  $\int \cos^{\text{odd}}(x)dx$  or  $\int \sin^{\text{odd}}(x)dx$  use

$$\cos^2(x) + \sin^2(x) = 1$$

and u-substitution

**Example:**  $\int \cos^5(x)dx$

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**Example:**  $\int \sin^2(x) dx$

For  $\int \cos^{\text{even}}(x) dx$  or  $\int \sin^{\text{even}}(x) dx$  use

$$\cos^2(x) = \frac{1}{2}(1 + \cos(2x))$$

$$\sin^2(x) = \frac{1}{2}(1 - \cos(2x))$$

possibly multiple times



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$$\cos^2(x) = \frac{1}{2}(1 + \cos(2x))$$

$$\sin^2(x) = \frac{1}{2}(1 - \cos(2x))$$

possibly multiple times

**Example:**  $\int \cos^4(x) dx$

# How do we integrate Trigonometric functions?

**Example:**  $\int \sin^2(x)\cos^3(x)dx.$

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**Example:**  $\int \sin^2(x)\cos^3(x)dx$ .

For  $\int \sin^{\text{anything}}(x)\cos^{\text{odd}}(x)dx$  or  $\int \cos^{\text{anything}}(x)\sin^{\text{odd}}(x)dx$  use

$$\cos^2(x) + \sin^2(x) = 1$$

and u-substitution

# How do we integrate Trigonometric functions?

**Example:**  $\int \sin^2(x)\cos^3(x)dx$ .

For  $\int \sin^{\text{anything}}(x)\cos^{\text{odd}}(x)dx$  or  $\int \cos^{\text{anything}}(x)\sin^{\text{odd}}(x)dx$  use

$$\cos^2(x) + \sin^2(x) = 1$$

and u-substitution

**Question:** What about  $\int \sin^{\text{even}}(x)\cos^{\text{even}}(x)dx$

# How do we integrate Trigonometric functions?

**Example:**  $\int \tan(x)\sec^4(x)dx.$

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**Example:**  $\int \tan(x)\sec^4(x)dx.$

For integrals involving  $\tan(x)$  and  $\sec(x)$  use

$$1 + \tan^2(x) = \sec^2(x)$$

and u-substitution.

# Some Challenges

**Example:** Find  $\int \sec(x) dx$ .

**Example:** Find  $\int \sec^3(x) dx$ .