Math 8, Winter 2005

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Function Decomposition

- $\sin(t)$ and $\cos(t)$ functions form the basis of sound waves.
- Given a function that represents a sound wave, we can decompose it into its component parts.
- This leads to computing integrals such as

$$\int f(x) \sin(nx)\; dx$$

$$\int f(x) \cos(mx)\; dx$$

- Use integration by parts
- End up with trigonometric integrals.

Trig Integrals

- Basics:

$$\int \cos(x)\,dx = \sin(x) + C$$

$$\int \sin(x)\,dx = -\cos(x) + C$$

$$\int \tan(x)\,dx = -\ln(\cos(x)) + C$$

$$\int \cot(x)\,dx = \ln(\sin(x)) + C$$

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- New formulae:

$$\int \sec(x)\, dx = \ln(|\sec(x) + \tan(x)|) + C$$

$$\int \csc(x)\, dx = \ln(|\csc(x) - \cot(x)|) + C$$

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Higher trig powers

- Idea: use trig identities to simplify the integrand.

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

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

$$\cot^2(x) + 1 = \csc^2(x)$$

Higher trig powers

- Idea: use trig identities to simplify the integrand.

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

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

$$\cot^2(x) + 1 = \csc^2(x)$$

- $$\int \sin^3(x)\cos^4(x)\ dx$$

- $$\int \cos^4(x)\ dx$$

- $$\int \tan^3(x)\sec^4(x)\ dx$$

- $$\int \tan(x)\sec^3(x)\ dx$$

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