7.3 Trig Integrals

Powers of Sine and Cosine

$$\int \sin^m(ax)\cos^n(ax)\,dx$$

ESSENTIAL QUESTION:
What trig identities may be helpful when integrands contain powers of sine and cosine?

CASE 1: Odd power of sine
Save one factor of sine, then convert the rest to cosine using the identity $\sin^2x = 1 - \cos^2x$.

1. $\int \sin^3 x\,dx$

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2. $\int \sin^5(4x)\cdot\cos(4)x\,dx$

CASE 2: Odd power of cosine
Save one factor of cosine, then convert the rest to sine using the identity $\cos^2x = 1 - \sin^2x$.

3. $\int \cos^3 x \cdot \sin^2 x\,dx$

CASE 3:
Even powers of sine and cosine
Make repeated use of these identities:

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

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

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4. $\int \sin^2 x \cdot \cos^2 x\,dx$