7.2 Trigonometric Integrals

Powers of Sine or Cosine

Odd Powers - Split one function off, and use Pythagorean identity: $\boxed{\cos^2(x) + \sin^2(x) = 1}$

Even Powers - Use half-angle identities: $\boxed{\sin^2(x) = \frac{1-\cos(2x)}{2},\ \cos^2(x) = \frac{1+\cos(2x)}{2}}$

Example 1 Simplify $\int \sin^5(x)\,dx$

Example 2 Simplify $\int \cos^4(x)\,dx$

Products of Sine and Cosine

Both Even - Use half angle (May need to use odd-even rules above)
At least one odd - Split off odd power and use Pythagorean identity.

Example 3 Evaluate $\int \sin^2(x)\cos^2(x)\,dx$

Example 4 Evaluate $\int \cos^5(x)\sin^2(x)\,dx$

Higher Powers of Trig Functions, use Power Reduction Formulas

Example 5 Evaluate $\int \sin^8(x)\,dx$ (Use: $-\frac{\sin^{n-1}(x)\cos(x)}{n} + \frac{n-1}{n}\int \sin^{n-2}(x)\,dx$)

Powers of tan, cot, csc

Example 6 Evaluate $\int \tan^3(\theta)\sec^4(\theta)\,d\theta$