14. Trig Integrals and Trig Substitution

Lec 13 mini review.

Integration by Parts: $\boxed{\int uv' = uv - \int u'v}$ or $\boxed{\int u\,dv = uv - \int v\,du}$

useful trig identities for some trig integrals:

$$\begin{aligned} \cos^2(x) + \sin^2(x) &= 1 \\ 1 + \tan^2(x) &= \sec^2(x) \\ \cos^2(x) &= \tfrac{1}{2}(1+\cos(2x)) \\ \sin^2(x) &= \tfrac{1}{2}(1-\cos(2x)) \end{aligned}$$

COMMON STRATEGIES FOR TRIG INTEGRALS

$$\boxed{\int \sin^m(x)\cos^n(x)\,dx}$$

* These notes are solely for the personal use of students registered in MAT1320.

Example 14.1. $\int_{\pi/6}^{\pi/3} \cos^3(x)\,dx$

If you don't already have these antiderivatives memorized, you should add them to your repertoire:

Example 14.2. $\int \tan^3(x)\,dx$

Trig Substitution

Example 14.3. $\displaystyle\int_{-1}^{1} \sqrt{1-x^2}\,dx$

General Strategy for Trig Substitution

Example 14.4. $\displaystyle\int \frac{1}{(4-x^2)^{3/2}}\,dx$

Example 14.5. $\int \frac{x}{\sqrt{x^2+4}}\,dx$

Example 14.6. $\displaystyle\int \frac{1}{\sqrt{2x^2+8x+6}}\,dx$

Study Guide

- $\diamond$ **strategy for trig integrals: using trig identities**
- $\diamond$ **trig substitution strategy for integrals such as** $\sqrt{1-x^2}$ $\sqrt{1+x^2}$ $\sqrt{x^2-1}$