MATH 134 – Calculus with Fundamentals 2
Practice Day 1 on Trigonometric Integrals
March 12, 2018

Background

Our approach to trigonometric integrals will be based in systematic application of *reduction formulas*. When you do these on quizzes and exams, formulas such as the following *will be provided* for your use in table format. You will be responsible for deciding which formula applies and for applying it correctly. Here are the first "batch of" these trigonometric reduction formulas:

- (SC1)

$$\int \sin^n(u) \ du = \frac{-\sin^{n-1}(u)\cos(u)}{n} + \frac{n-1}{n} \int \sin^{n-2}(u) \ du.$$

- (SC2)

$$\int \cos^n(u) \ du = \frac{\cos^{n-1}(u)\sin(u)}{n} + \frac{n-1}{n} \int \cos^{n-2}(u) \ du.$$

- (SC3 and SC4)

$$\int \sin^n(u) \cos^m(u) \ du$$

$$= \begin{cases} \dfrac{-\sin^{n-1}(u)\cos^{m+1}(u)}{n+m} + \dfrac{n-1}{n+m} \int \sin^{n-2}(u)\cos^m(u) \ du \\[2em] \dfrac{\sin^{n+1}(u)\cos^{m-1}(u)}{n+m} + \dfrac{m-1}{n+m} \int \sin^n(u)\cos^{m-2}(u) \ du \end{cases}$$

(Note: SC3 and SC4 give two separate formulas for the same integral appearing on the first line. In some cases both alternatives will apply and the choice of which one to use is up to you.)

Questions

For each of the integrals on the back, decide which of the reduction formulas above applies, determine the appropriate n (and m in the last two). Then apply the formula and complete the computation.

1. $\displaystyle\int \cos^3(x)\ dx$

2. $\displaystyle\int \sin^6(x)\ dx$

3. $\displaystyle\int \sin^2(4x)\cos^3(4x)\ dx$ (Let $u = 4x$ and convert to an equivalent integral in terms of u.)

4. $\displaystyle\int \frac{\sin^3(5x)}{\cos^4(5x)}\ dx$ (Let $u = 5x$ first; use SC3 once; the remaining integral can be finished by a different method if you look at it correctly.)