MATH 134 – Calculus with Fundamentals 2
Practice Day 2 on Trigonometric Integrals
March 13, 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 is the second "batch of" these trigonometric reduction formulas:

- (ST1)
$$\int \tan^n(u)\, du = \frac{\tan^{n-1}(u)}{n-1} - \int \tan^{n-2}(u)\, du.$$
- (ST2)
$$\int \tan(u)\, du = -\ln|\cos(u)| + C$$
- (ST3)
$$\int \sec^n(u)\, du = \frac{\tan(u)\sec^{n-2}(u)}{n-1} + \frac{n-2}{n-1}\int \sec^{n-2}(u)\, du.$$
- (ST4)
$$\int \sec(u)\, du = \ln|\sec(u) + \tan(u)| + C$$
- For integrals involving both secants and tangents, note that the indentity $1 + \tan^2(x) = \sec^2(x)$ shows that even powers of secants can be converted to even powers of tangents and vice versa. Many integrals involving $\sec(u)$ and $\tan(u)$ together can also be handled by rewriting $\tan(u) = \frac{\sin(u)}{\cos(u)}$, $\sec(u) = \frac{1}{\cos(u)}$ and applying the $\sin(u), \cos(u)$ reductions from last time.

Questions

For each of the following integrals, 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. $\int \sec^3(5x)\ dx$

2. $\int \tan^6(3x)\ dx$

3. $\int \tan^2(4x) \sec^3(4x)\ dx$ (Use $\tan^2(u) = 1 + \sec^2(u)$, then ST3.)

4. $\int \tan^3(5x) \sec^5(5x)\ dx$ (Convert to powers of $\sin(u)$ and $\cos(u)$.)