Trigonometric Identities-Notes Outline

Technique of Integration

MA 132-Morrison

Recall the following:

Pythagorean Identities:

$\sin^2 x+\cos^2 x=1$	$\tan^2 x+1=\sec^2 x$	$\cot^2 x+1=\csc^2 x$

Half Angle Identities:

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

Integrals

$\int \tan x dx=\ln\lvert\sec x\rvert+C$	$\int \sec x dx=\ln\lvert\sec x+\tan x\rvert+C$

Consider

$$\int \sin x\cos x dx$$

Then consider

$$\int \sin^2 x dx$$

Next consider

$$\int \sin^4 x dx$$

Other examples include

$\int \sin^2 x\cos^2 x dx$	$\int \cos^{10} x dx$

Note:

If $\sin^2 x + \cos^2 x = 1$, then $\cos^2 x = 1 - \sin^2 x$.

Any odd power can subtract one and be left with an even power. Any even power can be rewritten as a power of something squared.

Consider the following straight forward u-sub problem:

$$\int \cos^2 x \sin x dx$$

Then consider the following u-sub that requires a trig identity substitution first:

$$\int \cos^3 x \sin^4 x dx$$

Then consider this similar example:

$$\int \cos^5 x \sin^{10} x dx$$

- We can use Pythag when we have even powers (odd minus one is even)
- We can use Half-angle when we only have even powers
- When either sine or cosine is odd-
    - If sine is odd, choose cosine to be *u*, use Pythag identity to turn everything into cosine except one sine term that is necessary for *du*
    - If cosine is odd, choose sine to be *u*, use Pythag identity to turn everything into sine except one cosine term that is necessary for *du*

Other examples include:

$\int \sin^3 x \cos^8 x dx$	$\int \cos^3 x \sin^5 x dx$	$\int \frac{\cos^3 x}{\sin^4 x} dx$