Math 114, Prep 7.2 (Trigonometric Integrals)

Name: ________________________ **Section:** ________

Names of collaborators: ________________________

Main Points:

1. Use simple substitution
2. Use trig. identities

1. Using the Pythagorean Identity for Sine and Cosine

The Pythagorean identity $\sin^2 x + \cos^2 x = 1$ can be used with simple substitution to evaluate some trigonometric integrals. Read Examples 1 and 2 on page 471.

Exercises

1. Use the Pythagorean identity $\sin^2 x + \cos^2 x = 1$ and simple substitution to evaluate the integrals.

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

   (b) $\int \sin^7 x \, \cos^5 x \, dx$

2. Using the Half-Angle Formulas

For some trig integrals the half-angle formulas are more useful. Read page 472.

Exercises

2. State the half-angle formulas, given at the top of page 472.

3. Use the half-angle formulas to rewrite the integrand, and then evaluate the integral.

   (a) $\int \cos^2\theta\, d\theta$

   (b) $\int \sin^2\theta \cos^4\theta\, d\theta$

4. Explain how you can tell when it might be worthwhile to use the Pythagorean identity for sine and cosine and when it might be useful to use a half-angle formula instead.

3. Integrals with Tangent and Secant

Using the Pythagorean identity $\tan^2 x + 1 = \sec^2 x$ along with simple substitution is often useful for trig integrals involving tangent and secant. Read Examples 5 and 6 on pages 473 and 474.

Exercises

5. Evaluate the integrals:

   (a) $\int \tan^2\theta \sec^4\theta\, d\theta$.

(b) Evaluate $\int \tan x \sec^3 x \, dx$.

6. How can you tell when it might be useful to use the substitution $u = \tan x$ and when it might be better to use $u = \sec x$ instead?

7. State the antiderivatives of tangent and secant. (See the top of page 475.)

4. Using Product-to-Sum Identities

Another set of identities, sometimes called "product-to-sum" identities can also be useful.

Exercises

8. State the three "product-to-sum" identities, given in the red box on page 476.

9. Evaluate $\int \cos x \cos(4x) \, dx$.