AP Calculus AB
Section 7.2 – Notesheet

Name: ______________________________
Date: _____________ Block: __________

Indefinite Integration with "u" Substitution Procedure for Trigonometric Functions

Case 1: Trigonometric Functions raised to a power

1.) Let "u" be the trigonometric ratio raised to a power
2.) Determine $\frac{du}{dx}$
3.) Match $\frac{du}{dx}$ to the original function
4.) Substitute
5.) Find the antiderivative in terms of "u"
6.) Re-substitute for "x"

Reminder:

$\int \cos x \, dx = \sin x + c$

$\int \sin x \, dx = -\cos x + c$

$\int \sec^2 x \, dx = \tan x + c$

$\int \csc x \cot x \, dx = -\csc x + c$

$\int \sec x \tan x \, dx = \sec x + c$

$\int \csc^2 x \, dx = -\cot x + c$

Example 1: $\int \sin^6 x \cos x \, dx$

Example 2: $\int 2\cos^8 x \sin x \, dx$

Example 3: $\int \cot^4 x \csc^2 x \, dx$

Case 2: Trigonometric Functions of a quantity

1.) Let "u" be the quantity inside the trigonometric ratio
2.) Determine $\frac{du}{dx}$
3.) Match $\frac{du}{dx}$ to the original function
4.) Substitute
5.) Find the antiderivative in terms of "u"
6.) Re-substitute for "x"

Example 1: $\int 2x \cos(x^2 + 3)\, dx$

Example 2: $\int (x + 1) \sin(2x^2 + 4x - 3)\, dx$

Example 3: $\int \sin^4(3x) \cos(3x)\, dx$

Case 3: Inverse Trigonometric Functions

Reminder:

$\frac{d}{dx}\left(\sin^{-1}(f(x))\right) = \frac{f'(x)}{\sqrt{1-[f(x)]^2}}$ $\int \frac{f'(x)}{\sqrt{1-[f(x)]^2}}\,dx = \sin^{-1}(f(x)) + c$

$\frac{d}{dx}\left(\tan^{-1}(f(x))\right) = \frac{f'(x)}{1+[f(x)]^2}$ $\int \frac{f'(x)}{1+[f(x)]^2}\,dx = \tan^{-1}(f(x)) + c$

1.) Let "u" be the quantity inside the inverse trigonometric ratio
2.) Determine $\frac{du}{dx}$
3.) Match $\frac{du}{dx}$ to the original function
4.) Substitute
5.) Find the antiderivative in terms of "u"
6.) Re-substitute for "x"

Example 1: $\int \frac{4}{1+(4x)^2}\,dx$

Example 2: $\int \frac{2}{\sqrt{1-\frac{x^2}{4}}}\,dx$

Example 3: $\int \frac{1}{9+x^2}\,dx$

Example 4: $\int \frac{8}{\sqrt{4-16x^2}}\,dx$