5.1 Using Fundamental Identities

As you complete the table below, rate each of the groups of identities with a 3, 2, or 1.
3- I'm very familiar with this.
2- I'm somewhat familiar with this.
1- I've never seen this before...ever.

Reciprocal Identities: $sinu = \frac{1}{cscu}$ $tanu = \frac{1}{\cot u}$ $secu = \frac{1}{\cos u}$ $cosu = \frac{1}{\sec u}$ $cscu = \frac{1}{sinu}$ $cotu = \frac{1}{\tan u}$	3
Quotient Identities: $tanu = \frac{sinu}{cosu}$ $cotu = \frac{\cos u}{\sin u}$	3
Pythagorean Identities: $sin^2u + cos^2u = 1$ $\sin^2 u = 1 - \cos^2 u$ $1 + tan^2u = sec^2u$ $\cos^2 u = 1 - \sin^2 u$ $1 + cot^2u = \csc^2 u$	2 / 1
Cofunction Identities: $sin(\frac{\pi}{2} - u) = cosu$ $cos(\frac{\pi}{2} - u) = sinu$ $tan(\frac{\pi}{2} - u) = \cot u$ $csc(\frac{\pi}{2} - u) = \sec u$ $sec(\frac{\pi}{2} - u) = \csc u$ $cot(\frac{\pi}{2} - u) = \tan u$	
Even/Odd Identities **Provide an example for each** $\sin u$ $sin(-u) = -\sin u$ odd $csc(-u) = -\csc u$ $\cos u$ $cos(-u) = \cos u$ even $sec(-u) = \sec u$ $tan(-u) = -\tan u$ odd $cot(-u) = -\cot u$ $u = \pi/2$ $\sin(-\frac{\pi}{2}) = -1$ $-\sin\frac{\pi}{2} = -1$	

Using Identities to Evaluate a Function

1. Use the values $secu = -\frac{3}{2}$ and $tanu > 0$ to find the values of all six trigonometric functions.

2. Use the values of $sec\theta = \sqrt{2}$ and $sin\theta = -\frac{\sqrt{2}}{2}$ to find the values of all six trigonometric functions.

$\cos\theta = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

$\csc\theta = -\frac{2}{\sqrt{2}} = \frac{-2\sqrt{2}}{2} = -\sqrt{2}$

Simplifying Trigonometric Identities

1. Simplify $sinxcos^2x - sinx$

$\sin x(\cos^2 x - 1)$

$\sin x(-\sin^2 x) = \boxed{-\sin^3 x}$

2. Simplify $sinx + cotxcosx$

$\sin x + \frac{\cos x}{\sin x} \cdot \cos x$

$\sin x + \frac{\cos^2 x}{\sin x} = \frac{\sin^2 x}{\sin x} + \frac{\cos^2 x}{\sin x} = \frac{1}{\sin x} = \boxed{\csc x}$

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

3. Simplify $cosxtanx$

$\cancel{\cos x} \cdot \frac{\sin x}{\cancel{\cos x}} = \boxed{\sin x}$

Factoring a Trigonometric Expression

1. Factor $csc^2x - cotx - 3$

$1 + \cot^2 x - \cot x - 3$

$\cot^2 x - \cot x - 2$ $x^2 - x - 2$

$\boxed{(\cot x - 2)(\cot x + 1)}$ $(x-2)(x+1)$

2. Factor $sec^4x - tan^4x$

$\frac{1}{\cos^4 x} - \frac{\sin^4 x}{\cos^4 x} = \frac{1 - \sin^4 x}{\cos^4 x} = \frac{\cancel{\cos^4 x}}{\cancel{\cos^4 x}} = \boxed{1}$

OR $1 + \cancel{\tan^4 x} - \cancel{\tan^4 x} = \boxed{1}$

3. Factor $cot^2x - cot^2xcos^2x$

$\cot^2 x(1 - \cos^2 x)$

$\cot^2 x(\sin^2 x)$

$\frac{\cos^2 x}{\cancel{\sin^2 x}} \cdot \cancel{\sin^2 x} = \boxed{\cos^2 x}$

Rewriting a Trigonometric Expression

1. Rewrite $\frac{1}{1+sinx}$ so that it is not in fractional form.

$\frac{1}{1+\sin x} \cdot \frac{1-\sin x}{1-\sin x} = \frac{1-\sin x}{1-\sin^2 x} = \frac{1-\sin y}{\cos^2 x}$

$\frac{1}{\cos^2 x} - \frac{\sin x}{\cos^2 x} = \sec^2 x - \frac{\sin x}{\cos^2 x} = \boxed{\sec^2 x - \tan x \sec x}$

or $\sec x(\sec x - \tan x)$

$\frac{\sin x}{\cos x} \cdot \frac{1}{\cos x}$

2. Rewrite $\frac{sin^2y}{1-cosy}$ so that it is not in fractional form.

$\frac{1-\cos^2 y}{1-\cos y} = \frac{\cancel{(1-\cos y)}(1+\cos y)}{\cancel{1-\cos y}}$

$= 1 + \cos y$ ← OR →

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

$\frac{\cancel{\sin^2 y}(1+\cos y)}{\cancel{\sin^2 y}} = \boxed{1+\cos y}$

3. Rewrite $\frac{sinx}{tanx}$ so that it is not in fractional form.

$\cancel{\sin x} \cdot \frac{\cos x}{\cancel{\sin x}} = \boxed{\cos x}$

$\tan\theta = -1$

$\cot\theta = -1$