

Students will be able to use the fundamental identities to simplify expressions.

Examples: Simplify each expression using the fundamental identities.

a.) $\tan x \csc x$

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

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

$$\boxed{\sec x}$$

b.) $(1 - \cos^2 x)(\csc x)$

$$\sin^2 x \cdot \frac{1}{\sin x}$$

$$\boxed{\sin x}$$

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c.) $\cot x \sec x$

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

$$\frac{1}{\sin x} \rightarrow \boxed{\csc x}$$

d.) $\cos x (1 + \tan^2 x)$

$$\cos x \cdot \sec^2 x$$

$$\cos x \cdot \frac{1}{\cos^2 x} \rightarrow \frac{1}{\cos x}$$

$$\boxed{\sec x}$$

e.) $\frac{\sec x}{\csc x}$

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

$$\downarrow$$
$$\frac{\sin x}{\cos x}$$

$$\downarrow$$
$$\boxed{\tan x}$$

f.) $\frac{1 + \tan^2 x}{\sec^2 x}$

$$\frac{\sec^2 x}{\sec^2 x}$$

$$\boxed{1}$$

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g.) $\sec^2 x \tan^2 x + \sec^2 x$

$$\begin{aligned} & \sec^2 x (\tan^2 x + 1) \\ & \downarrow \quad \downarrow \\ & \sec^2 x \cdot \sec^2 x \\ & \boxed{\sec^4 x} \end{aligned}$$

h.) $1 - 2\sin^2 x + \sin^4 x$

$$\begin{aligned} & (1 - \sin^2 x)(1 - \sin^2 x) \\ & \downarrow \quad \downarrow \\ & \cos^2 x \cdot \cos^2 x \\ & \boxed{\cos^4 x} \end{aligned}$$

i.) $(\sec^3 x - \sec^2 x)(\sec x + 1)$

$$\begin{aligned} & \sec^2 x (\sec x - 1) - 1(\sec x - 1) \\ & (\sec x - 1)(\sec^2 x - 1) \\ & \downarrow \\ & (\sec x - 1) \cdot \tan^2 x \\ & \boxed{(\sec x - 1) \cdot \tan^2 x} \end{aligned}$$

j.) $\tan x + \frac{\cos x}{1 + \sin x}$

$$\begin{aligned} & \frac{1 + \sin x}{1 + \sin x} \cdot \frac{\sin x}{\cos x} + \frac{\cos x}{1 + \sin x} \cdot \frac{\cos x}{\cos x} \\ & \frac{\sin x + \sin^2 x + \cos^2 x}{\cos x(1 + \sin x)} \\ & \frac{\sin x + 1}{\cos x(1 + \sin x)} \\ & \frac{1}{\cos x} \\ & \boxed{\sec x} \end{aligned}$$

Students will be able to use the fundamental identities to simplify expressions.

$\frac{\sec x - 1}{\sec x + 1} + \frac{-1}{\sec x - 1} \cdot \frac{\sec x + 1}{\sec x + 1}$

$$\frac{\sec x - 1 - \sec x - 1}{(\sec x + 1)(\sec x - 1)}$$

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

$$\frac{-2}{\sec^2 x - 1}$$

$$\frac{-2}{\tan^2 x}$$

$$\boxed{-2 \cot^2 x}$$

i.) $\frac{\tan^2 x}{\csc x + 1} \cdot \frac{\csc x - 1}{\csc x - 1}$

$$\frac{\tan^2 x (\csc x - 1)}{\csc^2 x - 1}$$

$$\frac{\tan^2 x (\csc x - 1)}{\cot^2 x}$$

$$\frac{\tan^2 x (\csc x - 1)}{1}$$

$$\tan^2 x (\csc x - 1) \cdot \frac{\tan^2 x}{1}$$

$$\boxed{\tan^4 x (\csc x - 1)}$$