

Simplify each of the following.

1.  $\tan^2 x - \sec^2 x = \boxed{-1}$

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

3.  $\cos x + \tan x \sin x$   
 $\frac{\cos x}{\cos x} + \frac{\sin x \cdot \sin x}{\cos x} = \frac{\cos^2 x}{\cos x} + \frac{\sin^2 x}{\cos x} = \frac{\cos^2 x + \sin^2 x}{\cos x} = \frac{1}{\cos x} = \boxed{\sec x}$   
 mult. by cos.

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

5.  $\frac{\sin(-x)}{\cos(-x)} = \frac{-\sin x}{\cos x} = \boxed{-\tan x}$

6.  $\cos x \csc x = \cos x \cdot \frac{1}{\sin x} = \frac{\cos x}{\sin x} = \boxed{\cot x}$

7.  $\sec^4 x - \tan^4 x$   
 $(\sec^2 x - \tan^2 x)(\sec^2 x + \tan^2 x)$   
 $1(\sec^2 x + \tan^2 x)$   
 $\boxed{\sec^2 x + \tan^2 x}$  "yuck!"

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

9.  $\cot x \sin x$   
 $\frac{\cos x}{\sin x} \cdot \sin x = \boxed{\cos x}$

10.  $\sin \beta (\csc \beta - \sin \beta) = \sin \beta \csc \beta - \sin^2 \beta$   
 $= 1 - \sin^2 \beta$   
 $= \boxed{\cos^2 \beta}$

11.  $\frac{\cot x}{\csc x} = \frac{\cos x / \sin x}{1 / \sin x} = \frac{\cos x}{\sin x} \cdot \frac{\sin x}{1} = \boxed{\cos x}$

12.  $\sec \beta \cdot \frac{\sin \beta}{\tan \beta} = \frac{1}{\cos \beta} \cdot \frac{\sin \beta}{\sin \beta / \cos \beta} = \frac{1}{\cos \beta} \cdot \sin \beta \cdot \frac{\cos \beta}{\sin \beta} = \boxed{1}$

13.  $\cot^2 x - \cot^2 x \cos^2 x$   
 $\cot^2 x (1 - \cos^2 x)$   
 $\frac{\cos^2 x}{\sin^2 x} \cdot \sin^2 x = \boxed{\cos^2 x}$

14.  $\sin^2 x \sec^2 x - \sin^2 x$   
 $\sin^2 x (\sec^2 x - 1)$   
 $\sin^2 x (\tan^2 x)$  "yuck!"

15.  $\tan^4 x + 2 \tan^2 x + 1$   
 $(\tan^2 x + 1)(\tan^2 x + 1)$   
 $\sec^2 x \cdot \sec^2 x$   
 $\boxed{\sec^4 x}$

16.  $\sin^4 x - \cos^4 x$   
 $(\sin^2 x - \cos^2 x)(\sin^2 x + \cos^2 x)$   
 $(\sin^2 x - \cos^2 x)(1) = \boxed{\sin^2 x - \cos^2 x}$  "yuck!"

17.  $\sin^4 x + 2 \sin^2 x \cos^2 x + \cos^4 x$   
 $(\sin^2 x + \cos^2 x)(\sin^2 x + \cos^2 x)$   
 $(1)(1)$   
 $\boxed{1}$

18.  $\tan^2 x - \tan^2 x \sin^2 x$   
 $\tan^2 x (1 - \sin^2 x)$   
 $\tan^2 x \cdot \cos^2 x = \frac{\sin^2 x}{\cos^2 x} \cdot \cos^2 x = \boxed{\sin^2 x}$

19.  $(\sin x + \cos x)^2$   
 $(\sin x + \cos x)(\sin x + \cos x)$   
 $\sin^2 x + \sin x \cos x + \sin x \cos x + \cos^2 x$   
 $\sin^2 x + 2 \sin x \cos x + \cos^2 x$   
 $\boxed{1 + 2 \sin x \cos x}$  "yuck!"

20.  $(\cot x + \csc x)(\cot x - \csc x)$   
 $\cot^2 x - \csc^2 x$   
 $\boxed{-1}$