

# Key

## 14.3/ 14.4 Simplifying and Verifying Trig Identities Notes

### Day Two

Simplify.

1. Simplify:  $\cos \theta \csc \theta$ .

$$\frac{\cos \theta}{1} \cdot \frac{1}{\sin \theta} = \frac{\cos \theta}{\sin \theta} = \boxed{\cot \theta}$$

2. Simplify:  $\cos \theta \tan \theta$ .

$$\frac{\cos \theta}{1} \cdot \frac{\sin \theta}{\cos \theta} = \frac{\cos \theta \sin \theta}{\cos \theta} = \boxed{\sin \theta}$$

Verifying:

1. Verify that  $\tan^2 \theta - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$

$$\frac{\sin^2 \theta}{\cos^2 \theta} - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$$

$$\frac{\sin^2 \theta}{\cos^2 \theta} - \frac{\sin^2 \theta \cos^2 \theta}{\cos^2 \theta} = \tan^2 \theta \sin^2 \theta$$

$$\frac{\sin^2 \theta - \sin^2 \theta \cos^2 \theta}{\cos^2 \theta} = \tan^2 \theta \sin^2 \theta$$

Factor out  
a  
 $\sin^2 \theta$

$$\frac{\sin^2 \theta (1 - \cos^2 \theta)}{\cos^2 \theta} = \tan^2 \theta \sin^2 \theta$$

$$\frac{\sin^2 \theta \cdot \sin^2 \theta}{\cos^2 \theta} = \tan^2 \theta \sin^2 \theta$$

$$\frac{\sin^2 \theta}{\cos^2 \theta} \cdot \frac{\sin^2 \theta}{1} = \tan^2 \theta \sin^2 \theta$$

$$\tan^2 \theta \sin^2 \theta = \tan^2 \theta \sin^2 \theta$$

2. Verify that  $\sin \theta \frac{1}{\sin \theta} - \frac{\cos^2 \theta}{\cot^2 \theta} = \cos^2 \theta$

$$\frac{\sin \theta}{\sin \theta} - \frac{\cos^2 \theta}{\left(\frac{\cos \theta}{\sin \theta}\right)} = \cos^2 \theta$$

$$1 - \frac{\cos^2 \theta}{1} \cdot \frac{\sin^2 \theta}{\cos^2 \theta} = \cos^2 \theta$$

$$1 - \frac{\cos^2 \theta \cdot \sin^2 \theta}{\cos^2 \theta} = \cos^2 \theta$$

$$1 - \sin^2 \theta = \cos^2 \theta$$

$$\cos^2 \theta = \cos^2 \theta \checkmark$$

3. Verify that  $\sec^2 \theta - \tan^2 \theta = \tan \theta \cot \theta$  Both sides

$$\frac{1}{\cos^2 \theta} - \frac{\sin^2 \theta}{\cos^2 \theta} = \frac{\sin \theta}{\cos \theta} \cdot \frac{\cos \theta}{\sin \theta}$$

$$\frac{1 - \sin^2 \theta}{\cos^2 \theta} = 1$$

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

$$1 = 1 \checkmark$$

Get all in terms of sine + cosine

4. Verify that  $\csc^2 \theta + \sec^2 \theta = \frac{1 + \cot^2 \theta}{\cos^2 \theta}$

$$\frac{1}{\sin^2 \theta} + \frac{1}{\cos^2 \theta} = \frac{1 + \cot^2 \theta}{\cos^2 \theta}$$

$$\frac{\cos^2 \theta}{\cos^2 \theta \sin^2 \theta} + \frac{\sin^2 \theta}{\cos^2 \theta \sin^2 \theta} = \frac{\csc^2 \theta}{\cos^2 \theta}$$

$$\frac{1}{\cos^2 \theta \sin^2 \theta} = \frac{\frac{1}{\sin^2 \theta}}{\cos^2 \theta}$$

$$\frac{1}{\cos^2 \theta \cdot \sin^2 \theta} = \frac{1}{\sin^2 \theta} \cdot \frac{1}{\cos^2 \theta}$$

$$\frac{1}{\cos^2 \theta \sin^2 \theta} = \frac{1}{\sin^2 \theta \cos^2 \theta} \checkmark$$