

Lesson 81 Algebra 2 and Trig

Aim: How do we solve trig equations using reciprocal identities and double angle formulas?

- HW: Green Book Regents Test 3 pg 26 to 32 omit problems # 10,15,16,28,31,33,36,39
- What math course do you want next year?
- Tutoring next week 8am to 1pm at FHHS for this course

Do Now: Use a Double Angle Identity

Functions of the Double Angle

1. Which equation is equivalent to  $\cos 2\theta - 2 \sin \theta + 2 = 0$ ?
- (A)  $-2 \sin^2 \theta - 2 \sin \theta + 3 = 0$   
 (B)  $-2 \sin^2 \theta - 2 \sin \theta - 1 = 0$   
 (C)  $2 \cos^2 \theta + \cos \theta + 2 = 0$   
 (D)  $2 \cos^2 \theta - 2 \sin^2 \theta + 1 = 0$   
 (E)  $2 \cos \theta - \sin^2 \theta - 3 = 0$

$$\begin{aligned} \sin 2A &= 2 \sin A \cos A \\ \cos 2A &= \cos^2 A - \sin^2 A \\ \cos 2A &= 2 \cos^2 A - 1 \\ \cos 2A &= 1 - 2 \sin^2 A \\ \tan 2A &= \frac{2 \tan A}{1 - \tan^2 A} \end{aligned}$$

Extra Credit Challenge

1) Prove the identity:  $\frac{1 - \cos 2B}{\sin 2B} = \tan B$

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

$$\frac{1 - 1 + 2 \sin^2 B}{2 \sin B \cos B}$$

$$\frac{2 \sin^2 B}{2 \sin B \cos B}$$

$$\frac{\sin B}{\cos B}$$

$$\tan B = \tan B$$

HW: page 514-515  
3,4,5,6,11,13,15,16,19

$$\begin{aligned} 3. \quad 2 \sin^2 \theta &\stackrel{?}{=} 1 - \cos 2\theta \\ 2 \sin^2 \theta &\stackrel{?}{=} 1 - (1 - 2 \sin^2 \theta) \\ 2 \sin^2 \theta &= 2 \sin^2 \theta \checkmark \end{aligned}$$

$$\begin{aligned} 4. \quad \tan \theta + \frac{1}{\csc \theta} &\stackrel{?}{=} \frac{1 + \cos \theta}{\cot \theta} \\ \frac{\sin \theta}{\cos \theta} + \sin \theta &\stackrel{?}{=} \frac{1 + \cos \theta}{\cot \theta} \\ \frac{\sin \theta}{\cos \theta} + \frac{\sin \theta \cos \theta}{\cos \theta} &\stackrel{?}{=} \frac{1 + \cos \theta}{\cot \theta} \\ \frac{\sin \theta(1 + \cos \theta)}{\cos \theta} &\stackrel{?}{=} \frac{1 + \cos \theta}{\cot \theta} \\ \tan \theta(1 + \cos \theta) &\stackrel{?}{=} \frac{1 + \cos \theta}{\cot \theta} \\ \frac{1 + \cos \theta}{\cot \theta} &= \frac{1 + \cos \theta}{\cot \theta} \checkmark \end{aligned}$$

11. 4/5  
13. 3/5  
15. 4/3  
16. -44/117  
19. 336/527

$$\begin{aligned} 5. \quad \frac{\sin 2\theta + \sin \theta}{\cos 2\theta + \cos \theta + 1} &\stackrel{?}{=} \tan \theta \\ \frac{2 \sin \theta \cos \theta + \sin \theta}{2 \cos^2 \theta - 1 + \cos \theta + 1} &\stackrel{?}{=} \tan \theta \\ \frac{\sin \theta(2 \cos \theta + 1)}{\cos \theta(2 \cos \theta + 1)} &\stackrel{?}{=} \tan \theta \\ \frac{\sin \theta}{\cos \theta} &\stackrel{?}{=} \tan \theta \\ \tan \theta &= \tan \theta \checkmark \end{aligned}$$

$$\begin{aligned} 6. \quad \frac{\sin(A+B) + \sin(A-B)}{\sin(A+B) - \sin(A-B)} &\stackrel{?}{=} \tan A \cot B \\ \frac{\sin A \cos B + \cos A \sin B + \sin A \cos B - \cos A \sin B}{\sin A \cos B + \cos A \sin B - \sin A \cos B + \cos A \sin B} &\stackrel{?}{=} \tan A \cot B \\ &\stackrel{?}{=} \tan A \cot B \\ \frac{2 \sin A \cos B}{2 \cos A \sin B} &\stackrel{?}{=} \tan A \cot B \\ \frac{\sin A}{\cos A} \cdot \frac{\cos B}{\sin B} &\stackrel{?}{=} \tan A \cot B \\ \tan A \cot B &= \tan A \cot B \checkmark \end{aligned}$$

1) Solve for x:  $0^\circ \leq x < 360^\circ$ .  
 $\sin 2x - \cos x = 0$

Use a Double Angle Identity

### Functions of the Double Angle

$$\begin{aligned} \sin 2A &= 2 \sin A \cos A \\ \cos 2A &= \cos^2 A - \sin^2 A \\ \cos 2A &= 2 \cos^2 A - 1 \\ \cos 2A &= 1 - 2 \sin^2 A \\ \tan 2A &= \frac{2 \tan A}{1 - \tan^2 A} \end{aligned}$$

## Use Reciprocal Identity

- 2) Solve for  $q$  in the interval  $0 \leq q \leq 2\pi$ .  
when  $2 \sin q = \tan q$

3. Find to the nearest degree, the roots  
of  $\cos 2\theta - 2\cos\theta = 0$ .

### Functions of the Double Angle

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A$$

$$\cos 2A = 2 \cos^2 A - 1$$

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

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

$$4. \quad 2 \sin \theta = 3 \cot \theta$$

\*6. Find to the nearest degree, the values of  $\theta$  in the interval  $0^\circ \leq \theta \leq 360^\circ$  that are the solutions of the equation  $\sin(90^\circ - \theta) + 2\cos\theta = 2$

Which identity should be substituted?