TOPIC: DOUBLE ANGLE IDENTITIES

Double Angle Identities

◆ When the sum identities are used with the *same* two angles, we get the **double angle identities**.

TRIG IDENTITIES			
Name	**Identity**	**Example**	**Use when…**
Sum & Diff.	$\sin(a \pm b) = \sin a \cos b \pm \cos a \sin b$ $\sin(\theta + \theta) = \sin\theta \cos\theta + \cos\theta \sin\theta$		
Double Angle	$\sin 2\theta = 2$_____	$\cos^2 \frac{\pi}{12} - \sin^2 \frac{\pi}{12} =$	argument contains _____ *OR* you recognize a _____ of the identity
	$\cos 2\theta = \cos^2\theta - \sin^2\theta$ $= 1 - 2\sin^2\theta$ $= 2\cos^2\theta - 1$		
	$\tan 2\theta = \frac{2\tan\theta}{1 - \_\_\_\_\_^2\theta}$		

◆ To simplify expressions & verify identities, you'll need to recognize different **forms** of the Double Angle Identities.

EXAMPLE Simplify the expression, do not evaluate.

$\sin 15° \cos 15°$

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EXAMPLE Use the double angle formulas to verify the identity.

$(\boldsymbol{A})$

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

STRATEGIES: Simplifying Trig Expressions

- Constantly scan for identities
- Add fractions using a common denominator
- Break down in terms of sin & cos
- If $1 \pm \text{trig}(\theta)$, multiply top & bottom by $1 \mp \text{trig}(\theta)$
- Factor

Recall

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

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

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

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

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

(Double Angle Identities)

$(\boldsymbol{B})$

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

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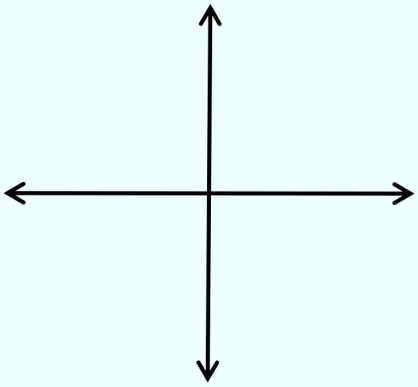
EXAMPLE Given $\cos\theta = \frac{4}{5}$ and $0 < \theta < \frac{\pi}{2}$, find $\sin(2\theta)$.



HOW TO: Evaluate Trig Functions Given Conditions

1) Expand identity & **identify** unknown trig value(s)

2) From given info, sketch & label* $\triangle$(s) in *proper quadrant*

3) Find missing sides using Pythag. Thm.*

4) Solve for unknown trig value(s) from **(1)**

5) Plug in values & simplify

**pay attention to* _____

Recall

$$\sin 2\theta = 2\sin\theta\cos\theta$$

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

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

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

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

(Double Angle Identities)

PRACTICE Given $\tan\theta = \frac{5}{12}$ and $0 < \theta < \frac{\pi}{2}$, find $\cos(2\theta)$.