Section 7.5   Multiple-Angle and Product-to-Sum Formulas

**Objective:** In this lesson you learned how to use multiple-angle formulas, power-reducing formulas, half-angle formulas, and product-to-sum formulas to rewrite and evaluate trigonometric functions.

I. Multiple-Angle Formulas  (Pages 575–577)

The most commonly used multiple-angle formulas are the

\[ \sin 2u = \quad \]  
\[ \cos 2u = \quad \]  
\[ \tan 2u = \quad \]

To obtain other multiple-angle formulas, . . .

**Example 1:** Use multiple-angle formulas to express \( \cos 3x \) in terms of \( \cos x \).
II. Power-Reducing Formulas  (Page 577)

Power-reducing formulas can be used to . . .

The power-reducing formulas are:

\[
\sin^2 u = \boxed{\text{expression}} \\
\cos^2 u = \boxed{\text{expression}} \\
\tan^2 u = \boxed{\text{expression}}
\]

III. Half-Angle Formulas  (Pages 578–579)

List the half-angle formulas:

\[
\sin \frac{u}{2} = \boxed{\text{expression}} \\
\cos \frac{u}{2} = \boxed{\text{expression}} \\
\tan \frac{u}{2} = \boxed{\text{expression}} = \boxed{\text{expression}}
\]

The signs of \( \sin \left( \frac{u}{2} \right) \) and \( \cos \left( \frac{u}{2} \right) \) depend on . . .

Example 2:  Find the exact value of \( \tan 15^\circ \).
IV. Product-to-Sum Formulas (Pages 579–581)

The product-to-sum formulas can be used to . . .

The product-to-sum formulas are:

\[
\begin{align*}
\sin u \sin v &= \phantom{=} \\
\cos u \cos v &= \phantom{=} \\
\sin u \cos v &= \phantom{=} \\
\cos u \sin v &= \phantom{=} \\
\end{align*}
\]

Example 3: Write \( \cos 3x \cos 2x \) as a sum or difference.

The sum-to-product formulas can be used to . . .

The sum-to-product formulas are:

\[
\begin{align*}
\sin x + \sin y &= \phantom{=} \\
\sin x - \sin y &= \phantom{=} \\
\cos x + \cos y &= \phantom{=} \\
\cos x - \cos y &= \phantom{=} \\
\end{align*}
\]
**Example 4:** Write $\cos 4x + \cos 2x$ as a sum or difference.