Trig

Angle Addition/Subtraction

Lets try an experiment?

What is $\cos(30° + 60°)$? $\cos 90 = 0$

Is it equal to $\cos 30° + \cos 60°$? $\frac{\sqrt{3}}{2} + \frac{1}{2}$

This demonstrates that trigonometric functions are **not** distributive.

Imagine $\sqrt{(4+9)} \neq 2 + 3$

The Formulas

Based on Geometry and distance Formula

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A-B) = \cos A \cos B + \sin A \sin B$$

$$\sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A-B) = \sin A \cos B - \cos A \sin B$$

The Formulas

Based on Geometry and distance Formula

$$\tan(A+B)=\frac{\tan A+\tan B}{1-\tan A\tan B}$$

$$\tan(A-B)=\frac{\tan A-\tan B}{1+\tan A\tan B}$$

Examples

Find the following

1. $\cos 75^\circ \rightarrow \cos(\overset{A}{45} + \overset{B}{30})$

$$\cos A \cos B - \sin A \sin B$$

$$\cos 45 \cos 30 - \sin 45 \sin 30$$

$$\frac{\sqrt{2}}{2} \bullet \frac{\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \bullet \frac{1}{2} \qquad = \frac{\sqrt{6} - \sqrt{2}}{4}$$

Prove $\sin 90° = 1$ by angle addition formulas.

$$\sin(45 + 45)$$

$$\sin A \cos B + \sin B \cos A$$

$$\sin 45 \cos 45 + \sin 45 \sin 45$$

$$\frac{\sqrt{2}}{2} \bullet \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} \bullet \frac{\sqrt{2}}{2} = 1$$

$$\cos 202^\circ \cos 22^\circ + \sin 202^\circ \sin 22^\circ$$

$$\cos A \cos B + \sin A \sin B$$

$$\cos(A - B)$$

$$\cos(202 - 22)$$

$$\cos(180)$$

-1

$$\frac{\tan\frac{\pi}{16}+\tan\frac{3\pi}{16}}{1-\tan\frac{\pi}{16}\tan\frac{3\pi}{16}}$$

$$\mathrm{Tan}(\mathrm{A}+\mathrm{B})$$

Group Problems

Find the following

$\sin 165°$

$\cos 255°$

$\tan 105°$