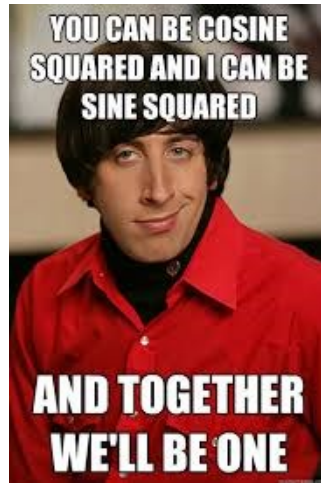


## Precalculus

### Lesson 7.5: Sum and Difference Formulas

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We continue with our study of more trigonometric identities:

#### Sum and Difference Formulas

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

$$\tan(\alpha + \beta) = \frac{\tan \alpha + \tan \beta}{1 - \tan \alpha \tan \beta}$$

$$\tan(\alpha - \beta) = \frac{\tan \alpha - \tan \beta}{1 + \tan \alpha \tan \beta}$$

The sum and difference identities may be used to find the exact value of angles not found on the unit circle.

$$\cos 75^\circ$$

$$\cos \frac{\pi}{12}$$

$$\sin \frac{7\pi}{12}$$

$$\sin 80^\circ \cos 20^\circ - \cos 80^\circ \sin 20^\circ$$

Given:

$$\sin \alpha = \frac{4}{5}, \quad \pi < \alpha < \frac{\pi}{2} \quad \text{and}$$

$$\sin \beta = -\frac{2\sqrt{5}}{5}, \quad \pi < \beta < \frac{3\pi}{2}$$

**find**  $\cos \alpha$

$\cos \beta$

$\cos(\alpha + \beta)$

$$\sin(\alpha + \beta)$$

Establish the identities (prove):

$$\frac{\cos(\alpha - \beta)}{\sin \alpha \sin \beta} = \cot \alpha \cot \beta + 1$$

$$\tan(\theta + \pi) = \tan \theta$$

$$\tan\left(\theta + \frac{\pi}{2}\right) = -\cot \theta$$

Find the exact value of:

$$\sin\left(\cos^{-1}\frac{1}{2} + \sin^{-1}\frac{3}{5}\right)$$