

Addition and Subtraction Formulas — 8.4

Cofunction Formulas

If u is any real number or the radian measure of an angle, then

$$\cos\left(\frac{\pi}{2} - u\right) = \sin u$$

$$\sin\left(\frac{\pi}{2} - u\right) = \cos u$$

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

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

$$\sec\left(\frac{\pi}{2} - u\right) = \csc u$$

$$\csc\left(\frac{\pi}{2} - u\right) = \sec u$$

Express as a cofunction of a complementary angle.

1. $\sin \frac{\pi}{12}$

2. $\cot(61.87^\circ)$

Addition and Subtraction Formulas

$$\sin(u + v) = \sin u \cos v + \cos u \sin v$$

$$\sin(u - v) = \sin u \cos v - \cos u \sin v$$

$$\cos(u + v) = \cos u \cos v - \sin u \sin v$$

$$\cos(u - v) = \cos u \cos v + \sin u \sin v$$

$$\tan(u + v) = \frac{\tan u + \tan v}{1 - \tan u \tan v}$$

$$\tan(u - v) = \frac{\tan u - \tan v}{1 + \tan u \tan v}$$

Find the exact values.

3. a) $\sin \frac{2\pi}{3} + \sin \frac{\pi}{4}$

b) $\sin \frac{11\pi}{12}$

4. a) $\cos 135^\circ - \cos 60^\circ$

b) $\cos 75^\circ$

Express as a trigonometric function of one angle.

5. $\cos 13^\circ \cos 50^\circ - \sin 13^\circ \sin 50^\circ$

6. $\sin(-5)\cos 2 + \cos 5 \sin(-2)$

7. If α and β are acute angles such that $\csc \alpha = \frac{13}{12}$ and $\cot \beta = \frac{4}{3}$, find

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

b) $\tan(\alpha + \beta)$

c) The quadrant containing $\alpha + \beta$

Verify the reduction formula.

$$8. \quad \sin\left(\theta - \frac{3\pi}{2}\right) = \cos\theta$$

Verify the identity.

$$9. \quad \cos\left(\theta + \frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}(\cos\theta - \sin\theta)$$

10.
$$\frac{1}{\tan \alpha + \tan \beta} = \frac{\cos \alpha \cos \beta}{\sin(\alpha + \beta)}$$

Use the addition or subtraction formulas to find the solutions of the equation that are in the interval $[0, \pi)$.

11.
$$\cos 5t \cos 3t = \frac{1}{2} + \sin(-5t) \sin 3t$$