

1) **Reciprocal Identities**

$$\sin\theta = \frac{1}{\csc\theta}, \quad \cos\theta = \frac{1}{\sec\theta}, \quad \tan\theta = \frac{1}{\cot\theta}$$

$$\csc\theta = \frac{1}{\sin\theta}, \quad \sec\theta = \frac{1}{\cos\theta}, \quad \cot\theta = \frac{1}{\tan\theta}$$

1) _____

2) **Quotient Identities** $\tan\theta = \frac{\sin\theta}{\cos\theta}, \quad \cot\theta = \frac{\cos\theta}{\sin\theta}$

2) _____

3) **Pythagorean Identities**

$$\sin^2\theta + \cos^2\theta = 1, \quad 1 + \tan^2\theta = \sec^2\theta, \quad 1 + \cot^2\theta = \csc^2\theta$$

3) _____

4) **Even-Odd Identities**

$$\begin{aligned} \sin(-\theta) &= -\sin\theta, & \cos(-\theta) &= \cos\theta, & \tan(-\theta) &= -\tan\theta \\ \csc(-\theta) &= -\csc\theta, & \sec(-\theta) &= \sec\theta, & \cot(-\theta) &= -\cot\theta \end{aligned}$$

4) _____

5) **Sum and Difference Formulas for Cosines**

1. $\cos(\alpha + \beta) = \cos\alpha \cos\beta - \sin\alpha \sin\beta$
2. $\cos(\alpha - \beta) = \cos\alpha \cos\beta + \sin\alpha \sin\beta$

5) _____

6) **Sum and Difference Formulas for Sines**

1. $\sin(\alpha + \beta) = \sin\alpha \cos\beta + \cos\alpha \sin\beta$
2. $\sin(\alpha - \beta) = \sin\alpha \cos\beta - \cos\alpha \sin\beta$

6) _____

7) **Sum and Difference Formulas for Tangents**

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

7) _____

8) **Double-Angle Formulas**

$$\begin{aligned} \sin 2\theta &= 2 \sin\theta \cos\theta \\ \cos 2\theta &= \cos^2\theta - \sin^2\theta = 2 \cos^2\theta - 1 = 1 - 2 \sin^2\theta \\ \tan 2\theta &= \frac{2 \tan\theta}{1 - \tan^2\theta} \end{aligned}$$

8) _____

9) **Half-Angle Identities**

$$\sin \frac{\theta}{2} = \pm \sqrt{\frac{1 - \cos \theta}{2}}, \quad \cos \frac{\theta}{2} = \pm \sqrt{\frac{1 + \cos \theta}{2}}$$
$$\tan \frac{\theta}{2} = \pm \sqrt{\frac{1 - \cos \theta}{1 + \cos \theta}} = \frac{1 - \cos \theta}{\sin \theta} = \frac{\sin \theta}{1 + \cos \theta}$$

9) _____

10) **Product-to-Sum Formulas**

1. $\sin \alpha \sin \beta = \frac{1}{2} [\cos(\alpha - \beta) - \cos(\alpha + \beta)]$
2. $\cos \alpha \cos \beta = \frac{1}{2} [\cos(\alpha - \beta) + \cos(\alpha + \beta)]$
3. $\sin \alpha \cos \beta = \frac{1}{2} [\sin(\alpha + \beta) + \sin(\alpha - \beta)]$
4. $\cos \alpha \sin \beta = \frac{1}{2} [\sin(\alpha + \beta) - \sin(\alpha - \beta)]$

10) _____

11) **Sum-to-Product Formulas**

1. $\sin \alpha + \sin \beta = 2 \sin \frac{\alpha + \beta}{2} \cos \frac{\alpha - \beta}{2}$
2. $\sin \alpha - \sin \beta = 2 \sin \frac{\alpha - \beta}{2} \cos \frac{\alpha + \beta}{2}$
3. $\cos \alpha + \cos \beta = 2 \cos \frac{\alpha + \beta}{2} \cos \frac{\alpha - \beta}{2}$
4. $\cos \alpha - \cos \beta = -2 \sin \frac{\alpha + \beta}{2} \sin \frac{\alpha - \beta}{2}$

11) _____