

TRIGONOMETRIC IDENTITIES

Hint: Learn a few patterns instead of memorizing every single identity on the list.

1. Reciprocal Identities:

$$(a) \sin \theta = \frac{1}{\csc \theta}$$

$$(b) \cos \theta = \frac{1}{\sec \theta}$$

$$(c) \tan \theta = \frac{1}{\cot \theta}$$

$$(d) \csc \theta = \frac{1}{\sin \theta}$$

$$(e) \sec \theta = \frac{1}{\cos \theta}$$

$$(f) \cot \theta = \frac{1}{\tan \theta}$$

2. Ratio Identities:

$$(a) \tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$(b) \cot \theta = \frac{\cos \theta}{\sin \theta}$$

3. Pythagorean Identities:

$$(a) \sin^2 \theta + \cos^2 \theta = 1$$

$$(b) \tan^2 \theta + 1 = \sec^2 \theta$$

$$(c) 1 + \cot^2 \theta = \csc^2 \theta$$

4. Even/Odd Identities:

$$(a) \sin(-\theta) = -\sin \theta$$

$$(b) \cos(-\theta) = \cos \theta$$

$$(c) \tan(-\theta) = -\tan \theta$$

$$(d) \csc(-\theta) = -\csc \theta$$

$$(e) \sec(-\theta) = \sec \theta$$

$$(f) \cot(-\theta) = -\cot \theta$$

5. Cofunction Identities:

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

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

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

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

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

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

6. Sum and Difference Formulas:

$$(a) \sin(\theta + \phi) = \sin \theta \cos \phi + \sin \phi \cos \theta$$

$$(b) \sin(\theta - \phi) = \sin \theta \cos \phi - \sin \phi \cos \theta$$

$$(c) \cos(\theta + \phi) = \cos \theta \cos \phi - \sin \theta \sin \phi$$

$$(d) \cos(\theta - \phi) = \cos \theta \cos \phi + \sin \theta \sin \phi$$

7. Double Angle Formulas:

$$(a) \sin 2\theta = 2 \sin \theta \cos \theta$$

$$(b) \begin{aligned} \cos 2\theta &= \cos^2 \theta - \sin^2 \theta \\ &= 2 \cos^2 \theta - 1 \\ &= 1 - 2 \sin^2 \theta \end{aligned}$$