

## Trigonometric Identities

### Fundamental Identities

$\cot \theta = \frac{1}{\tan \theta}$	$\sec \theta = \frac{1}{\cos \theta}$	$\csc \theta = \frac{1}{\sin \theta}$
$\tan \theta = \frac{\sin \theta}{\cos \theta}$	$\cot \theta = \frac{\cos \theta}{\sin \theta}$	
$\sin^2 \theta + \cos^2 \theta = 1$	$\tan^2 \theta + 1 = \sec^2 \theta$	$1 + \cot^2 \theta = \csc^2 \theta$
$\sin(-\theta) = -\sin \theta$	$\cos(-\theta) = \cos \theta$	$\tan(-\theta) = -\tan \theta$
$\csc(-\theta) = -\csc \theta$	$\sec(-\theta) = \sec \theta$	$\cot(-\theta) = -\cot \theta$

### Sum and Difference Identities

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

### Cofunction Identities

$\cos(90^\circ - \theta) = \sin \theta$
$\sin(90^\circ - \theta) = \cos \theta$
$\tan(90^\circ - \theta) = \cot \theta$
$\cot(90^\circ - \theta) = \tan \theta$
$\sec(90^\circ - \theta) = \csc \theta$
$\csc(90^\circ - \theta) = \sec \theta$

### Multiple-Angle and Half-Angle Identities

$\cos 2A = \cos^2 A - \sin^2 A$	$\cos 2A = 1 - 2 \sin^2 A$
$\cos 2A = 2 \cos^2 A - 1$	$\sin 2A = 2 \sin A \cos A$
$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$	$\cos \frac{A}{2} = \pm \sqrt{\frac{1 + \cos A}{2}}$
$\sin \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{2}}$	$\tan \frac{A}{2} = \pm \sqrt{\frac{1 - \cos A}{1 + \cos A}}$
$\tan \frac{A}{2} = \frac{\sin A}{1 + \cos A}$	$\tan \frac{A}{2} = \frac{1 - \cos A}{\sin A}$

### Sum and Product Identities

$\sin A \cos B = \frac{1}{2} [\sin(A + B) + \sin(A - B)]$
$\cos A \sin B = \frac{1}{2} [\sin(A + B) - \sin(A - B)]$
$\cos A \cos B = \frac{1}{2} [\cos(A + B) + \cos(A - B)]$
$\sin A \sin B = \frac{1}{2} [\cos(A - B) - \cos(A + B)]$
$\sin A + \sin B = 2 \sin \left( \frac{A + B}{2} \right) \cos \left( \frac{A - B}{2} \right)$
$\sin A - \sin B = 2 \cos \left( \frac{A + B}{2} \right) \sin \left( \frac{A - B}{2} \right)$
$\cos A + \cos B = 2 \cos \left( \frac{A + B}{2} \right) \cos \left( \frac{A - B}{2} \right)$
$\cos A - \cos B = -2 \sin \left( \frac{A + B}{2} \right) \sin \left( \frac{A - B}{2} \right)$