MTH 123 Trigonometric Identities Sheet
Grand Valley State University

Note: The following identities will utilize θ to represent an angle in identities that refer to a single angle. Additionally, identities referring to multiple angles will utilize α and β to represent these two distinct angles.

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

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