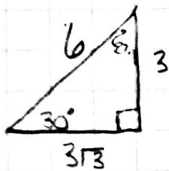


7.4 Trig Identities

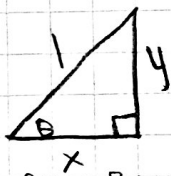


$$\begin{aligned} \sin 30^\circ &= \frac{1}{2} & \sin 60^\circ &= \frac{\sqrt{3}}{2} \\ \cos 30^\circ &= \frac{\sqrt{3}}{2} & \cos 60^\circ &= \frac{1}{2} \end{aligned}$$

Complementary Identities

$$\begin{aligned} \sin \theta &= \cos(90^\circ - \theta) \\ \cos \theta &= \sin(90^\circ - \theta) \end{aligned}$$

ex: $\sin 15^\circ = \cos 75^\circ$
 $\cos 43^\circ = \sin 47^\circ$



$$\begin{aligned} \sin \theta &= \frac{y}{1} \\ \cos \theta &= \frac{x}{1} \\ \tan \theta &= \frac{y}{x} \end{aligned}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta} = \frac{\cos \theta}{\sin \theta}$$

ex: Simplify

$$a) \cos \theta \tan \theta = \frac{\cos \theta}{1} \cdot \frac{\sin \theta}{\cos \theta} = \sin \theta$$

$$b) \cos x - \sin x \cot x =$$

$$\cos x - \sin x \cdot \frac{\cos x}{\sin x} =$$

$$\cos x - \cos x = 0$$

$$c) \frac{\sin x}{\tan x} = \frac{\sin x}{1} \cdot \frac{1}{\tan x} =$$

$$\sin x \cdot \cot x = \sin x \cdot \frac{\cos x}{\sin x} = \cos x$$

Tips to Simplify

- 1) break down everything in terms of $\sin \theta$ & $\cos \theta$
- 2) recognise reciprocal trigs
- 3) Use Pythagorean Identities



$$y^2 + x^2 = 1$$

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

$$\sin^2\theta + \cos^2\theta = 1$$

Pythagorean Identities

main form

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

ex: Simplify

RED FLAG

a) $\frac{\sin x \cos x}{1 - \cos^2 x} = \frac{\sin x \cos x}{\sin^2 x}$

$\frac{\sin x \cos x}{\sin x \sin x} = \boxed{\cot x}$

b) $\cos\theta(\sec\theta - \cos\theta) = \cos\theta \sec\theta - (\cos\theta)^2 = \frac{\cos\theta \cdot 1}{\cos\theta} - \cos^2\theta = \frac{1}{1 - \cos^2\theta} = \boxed{\frac{1}{\sin^2\theta}}$

c) $\frac{1}{\cos^2\theta} - \frac{1}{\cot^2\theta} =$

$\sec^2\theta - \tan^2\theta = 1$

d) $\cos^2 x (\sec^2 x - 1) =$

$\cos^2 x \cdot \tan^2 x$
 $\frac{\cos^2 x \cdot \sin^2 x}{\cos^2 x} = \sin^2 x$

e) $\frac{1}{\sin^2 x} - \frac{1}{\tan^2 x} = \csc^2 x - 1$

