Warm - Up

Prove $\sin x = \dfrac{1}{\csc x}$

$$\frac{opp}{hyp} = \frac{1}{\frac{hyp}{opp}}$$

$$\frac{opp}{hyp} = \frac{opp}{hyp}$$

Prove $\tan x = \dfrac{1}{\cot x}$

SWBAT understand the basic trigonometric identities

Agenda

- Warm-Up
- REMINDER - TEST WED/THURS
- REMINDER - QUIZ RETAKE TUESDAY
- Prove pythagorean identities
- ~~Exit Card~~

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Reciprocal Identities

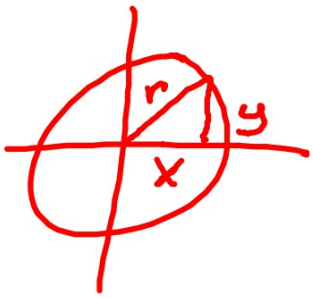
$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta} \qquad \cot\theta = \frac{1}{\tan\theta}$$

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

Quotient Identities

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

Proving Pythagorean Identity



$$x^2 + y^2 = r^2$$

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

$$\boxed{\cos^2 x + \sin^2 x = 1}$$

$$\frac{\cos^2\theta}{\cos^2\theta} + \frac{\sin^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$$

$$\boxed{1 + \tan^2\theta = \sec^2\theta}$$

$$\frac{\cos^2\theta}{\sin^2\theta} + \frac{\sin^2\theta}{\sin^2\theta} = \frac{1}{\sin^2\theta}$$

$$\boxed{\cot^2\theta + 1 = \csc^2\theta}$$

Using Identity

Find $\sin\theta$ and $\cos\theta$ if $\tan\theta = 5$ and $\cos\theta > 0$

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

$1 + 5^2 = \sec^2\theta$

$\sqrt{26} = \sqrt{\sec^2\theta}$

$\sqrt{26} = \sec\theta$

$\cos\theta \sqrt{26} = \frac{1}{\cos\theta} \cdot \cos\theta$

$\frac{\cos\theta \sqrt{26}}{\sqrt{26}} = \frac{1}{\sqrt{26}}$

$\cos\theta = \frac{1}{\sqrt{26}}$

$\frac{\sqrt{26}}{26}$

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

$\frac{1}{\sqrt{26}} \cdot 5 = \frac{\sin\theta}{\sqrt{26}} \cdot \sqrt{26}$

$\frac{5}{\sqrt{26}} = \sin\theta$

$\frac{5\sqrt{26}}{26}$

Odd / Even Identities

$\sin(-x) = -\sin x$ $\quad\quad$ $\cos(-x) = -\cos x$

$\tan(-x) = -\tan x$ $\quad\quad$ $\cot(-x) = -\cot x$

$\csc(-x) = -\csc x$ $\quad\quad$ $\sec(-x) = -\sec x$

Cofunction identities

What makes the graph of sine look like cosine?

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

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

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

Example:

If $\cos\theta = .34$, find $\sin(\theta - \pi/2)$

Simplify the expression:

$x^3 + xy^2$

$\sin^3 x + \sin x \cos^2 x$

$x(x^2+y^2)$

$\sin x(\sin^2 x + \cos^2 x)$

$\sin x(1)$

$\sin x$

Simplify the expression:

$[(\sec x + 1)(\sec x - 1)] / \sin^2 x$

$$\frac{\sec^2 x - \sec x + \sec x - 1}{\sin^2 x}$$

$$\frac{\sec^2 x - 1}{\sin^2 x}$$

$$\frac{\tan^2 x}{\sin^2 x} = \tan^2 x \cdot \frac{1}{\sin^2 x}$$

$$= \frac{\sin^2 x}{\cos^2 x} \cdot \frac{1}{\sin^2 x}$$

$$\frac{1}{\cos^2 x} = \sec^2 x$$

$1 + \tan^2 x = \sec^2 x$

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

Simplify the expression:

$$\frac{\cos x}{\cos x}\cdot\frac{\cos x}{1-\sin x}-\frac{\sin x}{\cos x}\cdot\frac{1-\sin x}{1-\sin x}$$

$$\frac{\cos^2 x}{\cos x(1-\sin x)}-\frac{\sin x+\sin^2 x}{\cos x(1-\sin x)}$$

$$\frac{(\cos^2 x+\sin^2 x)-\sin x}{\cos x(1-\sin x)}$$

$$\frac{(1-\sin x)}{\cos x(1-\sin x)}=\frac{1}{\cos x}=\sec x$$

Find all values of x in the interval $[0, 2\pi)$ that solves

$$\frac{\cos^3 x}{\sin x} = \cot x$$

$$\cos^2 x \left(\frac{\cos x}{\sin x}\right) = \cot x$$

$$\cos^2 x (\cot x) = \cot x$$

$$\cos^2 x (\cot x) - \cot x = 0$$

$$\cot x (\cos^2 x - 1) = 0$$

$$\cot x (\sin^2 x) = 0$$

Exit Card