5-Minute Check (over Lesson 5-2)

Use with Lesson **5-3**

Verify each identity.

1. $\sin x \tan x = \sec x - \cos x$

2. $1 = \tan x \cos x \csc x$

3. $\sec x - \sec x \sin^2 x = \cos x$

Standardized Test Practice

4. Which of the following is equivalent to $\frac{\tan \theta \cot \theta}{\csc \theta}$?

A $\cos \theta$ **B** $\sec \theta$ **C** $\sin \theta$ **D** $\csc \theta$

ANSWERS

1. $\sin x \tan x = \sin x\left(\frac{\sin x}{\cos x}\right)$
$= \frac{\sin^2 x}{\cos x}$
$= \frac{1 - \cos^2 x}{\cos x}$
$= \frac{1}{\cos x} - \frac{\cos^2 x}{\cos x}$
$= \sec x - \cos x$

2. $\tan x \cos x \csc x = \frac{\sin x}{\cancel{\cos x}} \cdot \cancel{\cos x} \cdot \frac{1}{\sin x}$
$= \frac{\sin x \cos x}{\sin x \cos x}$
$= 1$

3. $\sec x - \sec x \sin^2 x = \sec x(1 - \sin^2 x)$
$= \sec x(\cos^2 x)$
$= \frac{1}{\cos x} \cdot \cos^2 x$
$= \cos x$

4. C

1. ~~$\sin x \tan x$~~ ~~$\frac{\sin x}{1} \cdot \frac{\sin x}{\cos x}$~~

$\sec x - \cos x$

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

$\frac{1}{\cos x} - \frac{\cos^2 x}{\cos x}$

$\frac{1 - \cos^2 x}{\cos x}$

$\frac{\sin^2 x}{\cos x}$

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

$\tan x \cdot \sin x$ ✓

4. $\frac{\frac{\sin x}{\cos x} \cdot \frac{\cos x}{\sin x}}{\csc \theta}$

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

$\sin \theta$ C

Today we will use our identities to solve trig equations.

But first, let's review how to solve a trig equation.

Solve $4\sin^2 x + 1 = 4$, *Don't forget to check your solutions!*

$4\sin^2 x = 3$

$\sin^2 x = 3/4$

$\sin x = \pm\sqrt{3}/2$

$x = \pi/3,\ 2\pi/3,\ 4\pi/3,\ 5\pi/3$

Solve by factoring $\cos x \sin x = 3\cos x$

$0 = 3\cos x - \cos x \sin x$

$0 = \cos x\,(3 - \sin x)$

$\cos x = 0 \qquad 3 - \sin x = 0$

$\sin x = 3$

$x = \pi/2,\ 3\pi/2 \qquad$ no solution

Solve using substitution $\cos^4\vartheta + \cos^2\vartheta - 2 = 0$

$(\cos^2\theta + 2)(\cos^2\theta - 1) = 0$

$\cos^2\theta = -2 \qquad \cos^2\theta = 1$

no solution $\qquad \cos\theta = \pm 1$

$\theta = 0, \pi$

Now, Solve using an identity in the interval $[0, 2\pi]$.

$2\cos^2 x - \sin x - 1 = 0$

$2(1-\sin^2 x) - \sin x - 1 = 0$

$2 - 2\sin^2 x - \sin x - 1 = 0$

$-2\sin^2 x - \sin x + 1 = 0$

$2\sin^2 x + \sin x - 1 = 0$

$(2\sin x - 1)(\sin x + 1) = 0$

$2\sin x = 1$ $\quad$ $\sin x = -1$

$\sin x = 1/2$ $\quad$ $x = 3\pi/2$

$x = \pi/6, 5\pi/6$

$\sin^2 x - \sin x + 1 = \cos^2 x$

$\sin^2 x - \sin x + 1 = 1 - \sin^2 x$

$2\sin^2 x - \sin x = 0$

$\sin x(2\sin x - 1) = 0$

$\sin x = 0$ $\quad$ $2\sin x - 1 = 0$

$x = 0, \pi$ $\quad$ $\sin x = 1/2$

$x = \pi/6, 5\pi/6$

$1 - \cos x = 2\sin^2 x$

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

$1 - \cos x = 2 - 2\cos^2 x$

$2\cos^2 x - \cos x - 1 = 0$

$(2\cos x + 1)(\cos x - 1) = 0$

$\cos x = -1/2$ $\quad$ $\cos x = 1$

$x = 2\pi/3, 4\pi/3$ $\quad$ $x = 0$

Harder, this time you need to square both sides to be able to use an identity.

$\sin x - \cos x = 1$

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

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

$(\sin x - \cos x)(\sin x - \cos x) = 1$

$\sin^2 x - 2\cos x \sin x + \cos^2 x = 1$

$1 - 2\cos x \sin x = 1$

$-2\cos x \sin x = 0$

$\cos x \sin x = 0$

$\cos x = 0 \qquad \sin x = 0$

$x = \pi/2, \cancel{3\pi/2} \qquad x = \cancel{0}, \pi$

$\csc x - \cot x = 1$

$(\csc x - \cot x)^2 = 1^2$

$\cot^2 x + 1 = \csc^2 x$

$\csc^2 x - 2\csc x \cot x + \cot^2 x = 1$

$(\cot^2 x + 1) - 2\csc x \cot x + \cot^2 x = 1$

$2\cot^2 x - 2\csc x \cot x = 0$

$\frac{2\cos^2 x}{\sin^2 x} - \frac{2\cos x}{\sin^2 x} = 0$

$\frac{2\cos x(\cos x - 1)}{\sin^2 x} = 0$

$2\cos x = 0 \qquad \cos x - 1 = 0$

$\cos x = 0 \qquad \cos x = 1$

$\cos x = 0$

$x = \pi/2, \cancel{3\pi/2}$

$\cos x = 1$

$\cancel{x = 0}$

Assignment: Page 324 (45)
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