5.1 Continued/5.2

Find all x values on the interval from $[0,2\pi)$ that solve:

1. Like terms
2. Factor

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

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

$$\cos^3 x = \cancel{\cos x}$$
$$-\cos x \quad \cancel{-\cos x}$$

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

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

$$\cancel{\sin^2 x} + \cos^2 x = \cancel{1}$$
$$-\sin^2 x \quad -1 \quad \cancel{-1} \quad -\sin^2 x$$
$$\cos^2 x - 1 = -\sin^2 x$$

$$\cos x = 0 \qquad \cos^2 x - \cancel{1} = 0$$

$$\boxed{x = \frac{\pi}{2}, \frac{3\pi}{2}} \qquad -\sin^2 x = 0$$

$$\sin x = 0$$

$$\boxed{x = 0, \pi}$$

Jan 31-8:37 AM

$$\frac{\cancel{2}\sin^2 x}{\cancel{2}} = \frac{1}{2}$$

$$\sqrt{\sin^2 x} = \sqrt{\frac{1}{2}} = \frac{1}{\sqrt{2}}$$

$$\sin x = \pm\frac{\sqrt{2}}{2}$$

$$x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$$

Jan 31-9:25 AM

Solve: $2\sin^2 x + \sin x = 1$

$-1 \quad -1$

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

Let $w = \sin x$

$2w^2 + w - 1 = 0$

$(2w - 1)(w + 1) = 0$

$2w - 1 = 0 \quad w + 1 = 0$

$w = \frac{1}{2} \quad w = -1$

$\sin x = \frac{1}{2} \quad \sin x = -1$

$x = \frac{\pi}{6}, \frac{5\pi}{6}$

$x = \frac{3\pi}{2}$

Jan 31-9:28 AM

25. $(\sec^2 x + \csc^2 x) - (\tan^2 x + \cot^2 x)$

$\sec^2 x + \csc^2 x - \tan^2 x + \cot^2 x$

$1 + \cancel{\tan^2 x} + \cancel{\cot^2 x} + 1 - \cancel{\tan^2 x} - \cancel{\cot^2 x}$

2

Jan 31-9:53 AM

53. $\tan x \sin^2 x = \tan x$

$\qquad -\tan x \qquad -\tan x$

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

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

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

$\boxed{x = 0, \pi} \qquad +1 \quad +1$

$\sqrt{\sin^2 x} = \sqrt{1}$

$\sin x = \pm 1 \qquad \boxed{x = \frac{\pi}{2}, \frac{3\pi}{2}}$

Jan 31-9:55 AM

61. $\cancel{\cos^{-1}\cos}(\sin x) = \cos^{-1} 1$

$\sin x = \cos^{-1} 1$

$\sin x = 0$

$x = 0, \pi$

Jan 31-9:58 AM

5.2 Proving Trig Identities

Obj: 1. Determine if an eq. is an identity

2. Confirm identities analytically.

Prove: $\frac{x^2-1}{x-1} - \frac{x^2-1}{x+1} \stackrel{?}{=} 2$

LHS: $\frac{(x+1)\cancel{(x-1)}}{\cancel{x-1}} - \frac{\cancel{(x+1)}(x-1)}{\cancel{x+1}}$

$x+1-(x-1)$

$\cancel{x}+1\cancel{-x}+1$

2

Jan 31-10:22 AM

Prove: $\tan x + \cot x = \sec x \csc x$

LHS: $\frac{\sin x}{\sin x}\left(\frac{\sin x}{\cos x}\right) + \left(\frac{\cos x}{\sin x}\right)\frac{\cos x}{\cos x}$

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

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

$\csc x \cdot \sec x$

Jan 31-10:27 AM

$$\sin x(\cot x + \cos x \tan x) = \cos x + \sin^2 x$$

LHS:

$$\sin x\left(\frac{\cos x}{\sin x} + \frac{\cancel{\cos x}}{1}\cdot\frac{\sin x}{\cancel{\cos x}}\right)$$

$$\cancel{\sin x}\left(\frac{\cos x}{\cancel{\sin x}} + \sin x\right)$$

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

Jan 31-10:30 AM

$$\frac{\cancel{\sec x+1}}{\cancel{\sec x+1}}\left(\frac{1}{\sec x-1}\right) + \left(\frac{1}{\sec x+1}\right)\frac{\cancel{\sec x-1}}{\cancel{\sec x-1}} = 2\cot x\csc x$$

LHS:

$$\frac{\sec x+\cancel{1}+\sec x\cancel{-1}}{(\sec x+1)(\sec x-1)}$$

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

$$\frac{2\sec x}{\tan^2 x}$$

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

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

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

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

$$2\cot x\csc x$$

Jan 31-10:33 AM