

6.1 - Inverse Trigonometric Functions

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Warmup

Find the exact value

$$1) \tan \left(\cos^{-1} \left(\frac{5}{13} \right) \right) \quad \frac{12}{5}$$

$$2) \cot \left(\sin^{-1} \left(\frac{5}{13} \right) \right) \quad \frac{12}{5}$$

$$3) \tan \left(\sin^{-1} \left(-\frac{3}{5} \right) \right) \quad -\frac{3}{4}$$

$$4) \cos \left(\sin^{-1} \left(-\frac{4}{5} \right) \right) \quad \frac{3}{5}$$

$$5) \sin \left(\cos^{-1} \left(\frac{\sqrt{2}}{2} \right) \right) \quad \frac{\sqrt{2}}{2}$$

$$6) \cos \left(\sin^{-1} \left(\frac{1}{2} \right) \right) \quad \frac{\sqrt{3}}{2}$$

Chapter 6

Solving Trigonometric Equations

1. Inverse Trigonometric Functions
2. Solving One Trig Function
3. **Solving Multiple Trig Functions**

6.3 - Solving Multiple Trig Functions

Solve

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$$\sin x + \cos x = 1 \quad \text{Square both sides}$$

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

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

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

$$\begin{array}{c} \uparrow \quad \quad \quad \uparrow \\ \hline = 1 \end{array}$$

$$\sin x = 0 \quad \text{OR} \quad \cos x = 0$$

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

$$x = \{0, \cancel{\frac{\pi}{2}}, \cancel{\frac{3\pi}{2}}\} \quad \text{Test!}$$

6.3 - Solving Multiple Trig Functions

Solve

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$$\sin x + \cos x = 1 \quad \text{Square both sides}$$

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

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

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

$$\begin{array}{c} \uparrow \hspace{10em} \uparrow \\ \hspace{10em} = 1 \end{array}$$

$$\sin x = 0 \quad \text{OR} \quad \cos x = 0$$

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

$$x = \{0, \cancel{\frac{\pi}{2}}, \cancel{\frac{3\pi}{2}}\} \quad \text{Test!}$$

Practice - Solve on $0 \leq x < 2\pi$

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

$$x = \{0, \frac{3\pi}{2}\}$$

6.3 - Solving Multiple Trig Functions

Solve

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$$\sin 2x = \sin x$$

Hint: Do not divide by trig function.

$$x = \left\{ 0, \frac{\pi}{3}, \pi, \frac{5\pi}{3} \right\}$$

Practice - Solve on $0 \leq x < 2\pi$

$$\cos 2x = \sin x$$

$$x = \left\{ \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2} \right\}$$

6.3 - Solving Multiple Trig Functions

Solve using identities

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$$\sec^2 x = 2 \tan x + 4$$

$$x = \left\{ \frac{3\pi}{4}, \frac{7\pi}{4}, 1.25, 4.39 \right\}$$

Practice - Solve on $0 \leq x < 2\pi$

$$\csc^2 x + \cot x = 7$$

$$x = \{0.464, 3.605, 2.820, 5.961\}$$



Ch 6 Review

6.1 - Inverse Trigonometric Functions

Inverse

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Practice - Evaluate as a fraction

$$\sec \left(\cos^{-1} \left(\frac{5}{13} \right) + \sin^{-1} \left(-\frac{3}{5} \right) \right) \quad \frac{65}{56}$$

6.1 - Inverse Trigonometric Functions

Inverse

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Practice - Simplify without calculator

$$3 \sin(\cos^{-1}(-2 \sin(\tan^{-1} x)))$$

$$\frac{3\sqrt{(1-3x^2)(x^2+1)}}{x^2+1}$$

6.2 - Solving One Trig Function

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Practice - Solve for x where $0^\circ \leq x < 360^\circ$

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

$x = 18.43^\circ, 198.43^\circ,$
 $135^\circ, 315^\circ$

2) $\cot^{-1}(\sin(\sec^{-1} x)) = 78^\circ$

$x = \pm 1.02$

