

Complete all problems with your group, starting with your group's problem. You will be putting your problem on the board, so make sure it is neat and correct!

1. Prove: $\cot x (\tan x \sin x + \cos x) = \csc x$

$$\begin{aligned} \Rightarrow R \quad & \cancel{\cot x} \tan x \cdot \sin x + \cot x \cdot \cos x = \\ & \sin x + \frac{\cos x}{\sin x} \cdot \cos x = \\ & \frac{\sin^2 x + \cos^2 x}{\sin x} = \\ & \frac{1}{\sin x} = \\ & \csc x \quad \checkmark \end{aligned}$$

2. Prove: $\csc x - \sin x = \cot x \cos x$

$$\begin{aligned} \Rightarrow R \quad & \frac{1}{\sin x} - \sin x = \\ & \frac{1 - \sin^2 x}{\sin x} = \\ & \frac{\cos^2 x}{\sin x} = \\ & \frac{\cos x \cdot \cos x}{\sin x} = \\ & \cot x \cos x \quad \checkmark \end{aligned}$$

3. Prove: $\cos 3x + \cos x = 2 \cos 2x \cos x$

$$\begin{aligned} \Rightarrow R \quad & \cos(2x+x) + \cos(2x-x) = \\ & \underbrace{\cos 2x \cos x - \sin 2x \sin x} + \underbrace{\cos 2x \cos x + \sin 2x \sin x} = \\ & 2 \cos 2x \cos x \quad \checkmark \end{aligned}$$

4. Prove: $\frac{2}{1 + \cos 2x} = \sec^2 x$

$\hookrightarrow R$

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

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

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

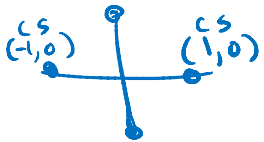
5. Solve for x over $[0, 2\pi)$: $2 \tan x \cos x = \tan x$

$$2 \tan x \cos x - \tan x =$$

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

$$\tan x = 0 \quad \cos x = \frac{1}{2}$$

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



6. Solve for x over $[0, 2\pi)$: $\cos 2x = \cos x$

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

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

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

$$\cos x = -\frac{1}{2}, 1$$

$$x = \frac{2\pi}{3}, \frac{4\pi}{3}, 0$$



7. Find the exact value of the trig function: $\tan\left(\frac{7\pi}{12}\right)$

$$\tan\left(\frac{3\pi}{12} + \frac{4\pi}{12}\right) = \tan\left(\frac{\pi}{4} + \frac{\pi}{3}\right) = \frac{\tan \frac{\pi}{4} + \tan \frac{\pi}{3}}{1 - \tan \frac{\pi}{4} \tan \frac{\pi}{3}} = \frac{1 + \sqrt{3}}{1 - \sqrt{3}}$$

8. Find the exact value of the trig function: $\cos\left(\frac{7\pi}{8}\right)$ Quad 2 (cos is neg)

$$\cos\left(\frac{7\pi}{8}\right) = -\sqrt{\frac{1 + \cos \frac{7\pi}{4}}{2}} = -\sqrt{\frac{1 + \frac{\sqrt{2}}{2}}{2 \cdot 2}} = -\sqrt{\frac{2 + \sqrt{2}}{4}} = \frac{-\sqrt{2 + \sqrt{2}}}{2}$$

