

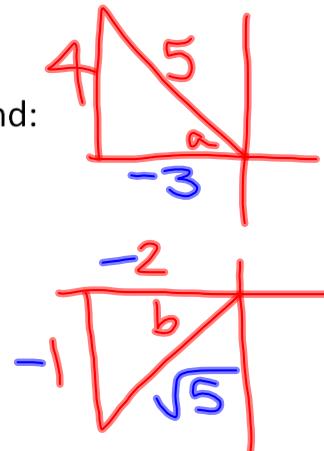
Review:

Given $\csc a = \frac{5}{4}$, $a \in QII$, and $\tan b = \frac{1}{2}$, $b \in QIII$, find:

$$\begin{aligned}\cos(a - b) &= \cos a \cos b + \sin a \sin b \\ &= \left(\frac{-3}{5}\right)\left(\frac{-2}{\sqrt{5}}\right) + \left(\frac{4}{5}\right)\left(\frac{-1}{\sqrt{5}}\right) \\ &= \frac{6}{5\sqrt{5}} - \frac{4}{5\sqrt{5}} = \boxed{\frac{2}{5\sqrt{5}}}\end{aligned}$$

$$\begin{aligned}\sin(2a) &= 2 \sin a \cos a \\ &= 2 \left(\frac{4}{5}\right)\left(\frac{-3}{5}\right) = \boxed{\frac{-24}{25}}\end{aligned}$$

$$\begin{aligned}\tan\left(\frac{a}{2}\right) &= \frac{1 - \cos a}{\sin a} \stackrel{s.}{=} \frac{1 - \left(\frac{-3}{5}\right)}{\frac{4}{5}} = \frac{\frac{5}{5} + \frac{3}{5}}{\frac{4}{5}} = \frac{\frac{8}{5}}{\frac{4}{5}} = \boxed{2}\end{aligned}$$



Prove:

1. $\tan x + \cot x = \sec x \csc x$

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

3. $\frac{1}{2} \csc^2\left(\frac{x}{2}\right)$

4. $\sec 2x = \frac{\sec^2 x}{2 - \sec^2 x}$

5. $\tan\frac{x}{2} = \frac{\tan x}{\sec x + 1}$

6. $\frac{1 + \cos 2x}{\sin 2x} = \cot x$

7. $\frac{\sin x - \cos x}{\cos^2 x} = \frac{\tan^2 x - 1}{\sin x + \cos x}$

8. $\sin 3x \cos 3x = \frac{1}{2} \sin 6x$

9. $\cos^2 x - 2 \sin^2 x \cos^2 x - \sin^2 x + 2 \sin^4 x = \cos^2 2x$

10. $\cos 3x = 4 \cos^3 x - 3 \cos x$

3. $\frac{1}{2} \csc^2\left(\frac{x}{2}\right)$

$$\begin{aligned}&= \frac{1}{2} \left[\csc \frac{x}{2} \right]^2 = \frac{1}{2} \left[\frac{1}{\sin \frac{x}{2}} \right]^2 \\&= \frac{1}{2} \left[\frac{1}{\sqrt{\frac{1 - \cos x}{2}}} \right]^2 = \frac{1}{2} \cdot \frac{2}{1 - \cos x}\end{aligned}$$

$$\begin{aligned}&= \frac{1}{1 - \cos x} \cdot \frac{1 + \cos x}{1 + \cos x} = \dots\end{aligned}$$