

1. Find $\tan \theta$ if $\cos 2\theta = \frac{3}{4}$ and $180^\circ < \theta < 270^\circ$.

2. Verify that the following equation is an identity.

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

3. Write $\sin 3x$ in terms of $\sin x$.

4. Find the exact value of $\sin 112.5^\circ$.

5. Given $\sin x = -\frac{4}{5}$ and $\pi < x < \frac{3\pi}{2}$, find $\cos \frac{x}{2}$.

Q: What has many keys but can't open any doors?