

Aim: What are the trigonometric half angle identities?**I. Do Now:**

1. If $\cos x = -\frac{5}{8}$ and angle x is in

Quadrant II, find $\cos 2x$.

2. Prove the identity:

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

Half Angle Identities

$$\cos\left(\frac{1}{2}x\right) =$$

$$\sin\left(\frac{1}{2}x\right) =$$

$$\tan\left(\frac{1}{2}x\right) =$$

The sign depends on the quadrant in which $\frac{1}{2}x$ lies.**II. Derivation of Half Angle Identities**3. Recall that $\cos 2A = 1 - 2\sin^2 A$.(a) Substitute $\frac{1}{2}x$ for A :(b) Solve the equation you wrote in part (a) for $\sin\left(\frac{1}{2}x\right)$.4. Recall that $\cos 2A = 2\cos^2 A - 1$ (a) Substitute $\frac{1}{2}x$ for A :(b) Solve the equation you wrote in part (a) for $\cos\left(\frac{1}{2}x\right)$.5. Find $\tan\left(\frac{1}{2}x\right)$.**III. Applications**6. If $\cos x = \frac{4}{5}$ and x is an acute angle, find

$$\tan\left(\frac{x}{2}\right).$$

7. If $\cos \theta = -\frac{14}{64}$ and θ is in Quadrant III, find:(a) $\cos \frac{1}{2}\theta$ (b) $\sin \frac{1}{2}\theta$ (c) $\tan \frac{1}{2}\theta$ 8. If $\sin x = \frac{5}{13}$ and $\frac{\pi}{2} < x < \pi$, find theexact value of $\cos \frac{x}{2}$.9. If $\tan A = -\sqrt{\frac{1 - \cos 210^\circ}{1 + \cos 210^\circ}}$ and angle A is obtuse, find the measure of angle A .10. If $\sin \theta = \sqrt{\frac{1 - \cos \frac{\pi}{3}}{2}}$ and θ terminates in Quadrant I, find θ .11. Find the exact value of $\tan \frac{5\pi}{8}$.