

**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  $\theta$  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  $\theta$  terminates in Quadrant I, find  $\theta$ .11. Find the exact value of  $\tan \frac{5\pi}{8}$ .**HW30**

- p. 451: 33, 34, 35, 40, 47, 49, 50, 51
- p. 455: 11, 26, 32, 38