

5-5-1 Double Angle Identities

Ex 1 find double angle values

$$\text{if } \sin \theta = \frac{-7}{25} \text{ on } \left(\pi, \frac{3\pi}{2}\right)$$

find $\sin 2\theta$, $\cos 2\theta$, $\tan 2\theta$

① Draw a triangle w/ given info

② Use Pythagorean Theorem to find missing side

③ find single trig functions

④ Use double angle identities

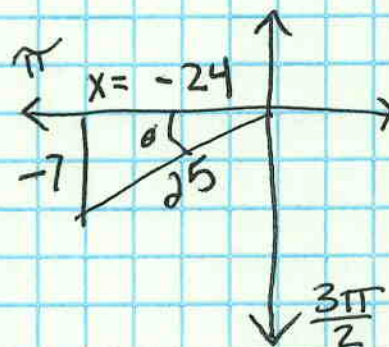
$$(-7)^2 + x^2 = 25^2$$

$$49 + x^2 = 625$$

$$-49 \quad -49$$

$$x^2 = 576$$

$$x = 24$$



$$\cos \theta = \left(\frac{-24}{25}\right) \quad \tan \theta = \left(\frac{7}{24}\right)$$

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$= 2 \left(\frac{-7}{25}\right) \left(\frac{-24}{25}\right)$$

$$\boxed{\sin 2\theta = \frac{336}{625}}$$

$$\cos 2\theta = 1 - 2 \sin^2 \theta$$

$$= 1 - 2 \left(\frac{-7}{25}\right)^2$$

$$\frac{625}{625} - \frac{98}{625} = \frac{527}{625} = \cos 2\theta$$

$$\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$$

$$\frac{2 \left(\frac{7}{24}\right)}{\frac{24^2}{24^2} - \frac{49}{24^2}}$$

$$= \frac{\left(\frac{14}{24}\right)}{\left(\frac{527}{24^2}\right)} = \frac{24^2}{527} = \frac{336}{527} = \tan 2\theta$$

Ex2: Solve trig equations using Double Angle ID

solve: $\sin 2\theta - \sin \theta = 0$ on $[0, 2\pi)$

$$2\sin \theta \cos \theta - \sin \theta = 0$$

* Use D.A. ID

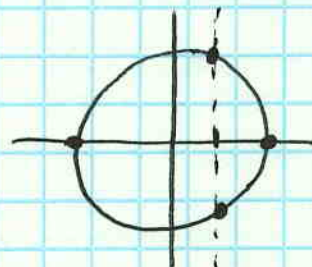
$$\sin \theta (2\cos \theta - 1) = 0$$

$$\sin \theta = 0$$

$$\begin{array}{l} \theta = 0, \pi \\ \theta = \frac{\pi}{3}, \frac{5\pi}{3} \end{array}$$

$$2\cos \theta - 1 = 0$$

$$\cos \theta = \frac{1}{2}$$



352: 1, 2, 4, 9, 10, 12, 15