

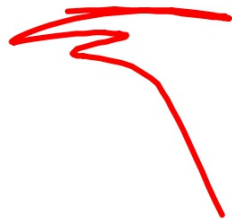
Warm - Up

Prove the Identity: $\sin 2u = 2 \sin u \cos u$

$$\sin(u+u)$$

$$\sin u \cos u + \cos u \sin u$$

$$2 \sin u \cos u$$



SWBAT use the double angle formulas to find trig values

SWBAT use the double angle formulas to prove different identities.

Agenda:

- Warm - Up

- HW Qs

- Double Angle Formulas

- Practice

- Exit Card

HW - ????

Double Angle Identities

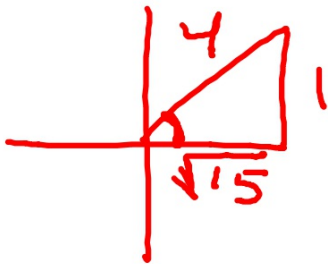
$$\sin 2u = 2 \sin u \cos u$$

$$\cos 2u = \begin{cases} \cos^2 u - \sin^2 u \\ 2\cos^2 u - 1 \\ 1 - 2\sin^2 u \end{cases}$$

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

Example:

if $\sin\theta = 1/4$ and θ has its terminal side in the first quadrant, find the exact value of $\sin 2\theta$.



~~$\frac{8\sqrt{15}}{16}$~~

$$\begin{aligned}\sin 2\theta &= 2\sin\theta\cos\theta \\ &= 2\left(\frac{1}{4}\right)\left(\frac{\sqrt{15}}{4}\right) \\ &= \frac{2}{4}\left(\frac{\sqrt{15}}{4}\right) \\ &= \frac{2\sqrt{15}}{16} \\ &= \frac{\sqrt{15}}{8}\end{aligned}$$

Example:

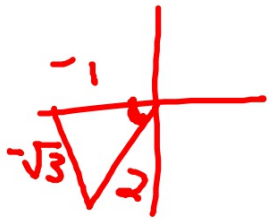
use the double angle identity to find the exact value of $\sin(8\pi/3)$.

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

$$\sin\left(2 \cdot \frac{4\pi}{3}\right) = 2 \sin\left(\frac{4\pi}{3}\right) \cos\left(\frac{4\pi}{3}\right)$$

$$= 2 \left(-\frac{\sqrt{3}}{2}\right) \left(-\frac{1}{2}\right)$$

$$= \cancel{+2} \left(\frac{\sqrt{3}}{2}\right)$$



Prove the identity: $\cos^4\theta - \sin^4\theta = \cos 2\theta$.

$$\begin{aligned} & (\cos^2\theta - \sin^2\theta)(\cos^2\theta + \sin^2\theta) \\ & (\cos 2\theta)(1) \\ & \cos 2\theta \end{aligned}$$

Half Angle Identities

$$\sin \frac{u}{2} = \pm \sqrt{\frac{1 - \cos u}{2}}$$

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$$\cos \frac{u}{2} = \pm \sqrt{\frac{1 + \cos u}{2}}$$

$$\tan \frac{u}{2} = \begin{cases} \pm \sqrt{\frac{1 - \cos u}{1 + \cos u}} \\ \frac{1 - \cos u}{\sin u} \\ \frac{\sin u}{1 + \cos u} \end{cases}$$

Example:

Use a half angle identity to find the exact value of $\sin \pi/12$.

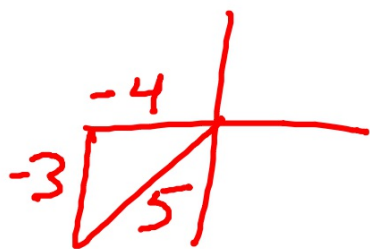
$$\sin\left(\frac{\pi}{12}\right) = \pm \sqrt{\frac{1 - \cos \frac{\pi}{6}}{2}}$$

$$= \pm \sqrt{\frac{1 - \frac{\sqrt{3}}{2}}{2}} = \pm \sqrt{\frac{\frac{2 - \sqrt{3}}{2}}{2}}$$

$$= \pm \sqrt{\frac{2 - \sqrt{3}}{2}} \cdot \frac{1}{2} = \pm \sqrt{\frac{2 - \sqrt{3}}{4}}$$

$$= \pm \frac{\sqrt{2 - \sqrt{3}}}{2}$$

$\cot\theta = 4/3$ and $\pi < \theta < 3\pi/2$. Find $\sin 2\theta$.



$$\begin{aligned}\sin 2\theta &= 2\sin\theta\cos\theta \\ &= 2 \cdot \frac{-3}{5} \cdot \frac{-4}{5} \\ &= \frac{24}{25}\end{aligned}$$

Exit Card:

$\sin\theta = -4/5$ and $270 < \theta < 360$. Find $\cos 2\theta$.

$$\cos 2u = \begin{cases} \cos^2 u - \sin^2 u \\ 2\cos^2 u - 1 \\ 1 - 2\sin^2 u \end{cases}$$

