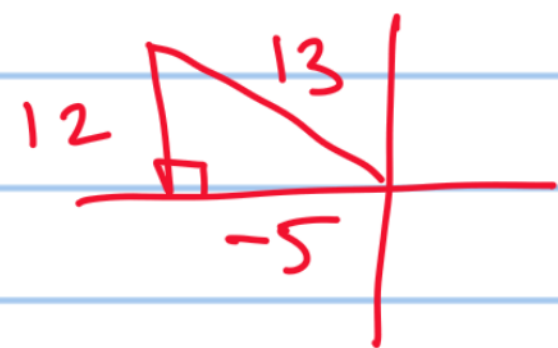


Example

Find the exact value of ~~1/13~~ $\sin \theta = \frac{12}{13}$, $\frac{\pi}{2} < \theta < \pi$



a) $\sin 2\theta$

b) $\cos 2\theta$

c) $\tan 2\theta$

a) $\sin 2\theta = 2 \sin \theta \cos \theta$
 $= 2 \left(\frac{12}{13} \right) \left(\frac{-5}{13} \right)$

$$= \boxed{\frac{-120}{169}}$$

b) $1 - 2 \sin^2 \theta$
 $1 - 2 \left(\frac{12}{13} \right)^2$
 $1 - 2 \left(\frac{144}{169} \right)$
 $1 - \frac{288}{169}$

$$\frac{169}{169} - \frac{288}{169} = \boxed{\frac{-119}{169}}$$

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

$$= \frac{2 \left(\frac{12}{-5} \right)}{1 - \left(\frac{12}{-5} \right)^2}$$

$$\frac{-\frac{24}{5}}{1 - \frac{144}{25}}$$

$$\begin{aligned} &= \frac{-\frac{24}{5}}{\frac{25-144}{25}} \\ &= \frac{-\frac{24}{5} \cdot \frac{25}{25}}{-119} \\ &= \boxed{\frac{120}{119}} \end{aligned}$$

Find all values of x

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

$$(2 \sin \theta \cos \theta) \sin \theta = \cos \theta$$

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

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

$$\cos \theta = 0 \quad \text{or} \quad 2 \sin^2 \theta - 1 = 0$$

$$\sqrt{\sin^2 \theta} = \sqrt{1/2}$$

$$\frac{\sqrt{1}}{\sqrt{2}} = \frac{1}{\sqrt{2}} \quad \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$$

$$\sin \theta = \frac{\sqrt{2}}{2}$$

$$\theta = \frac{\pi}{2} + 2\pi k$$

$$k \in \mathbb{Z}$$

$$\theta = \frac{3\pi}{2} + 2\pi k$$

$$\theta = \frac{\pi}{4} + 2\pi k$$

$$k \in \mathbb{Z}$$

$$\theta = \frac{3\pi}{4} + 2\pi k$$

Example

Find all values of x

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

$$\theta = \frac{\pi}{2} + \pi k$$

$$\theta = \frac{\pi}{2} + 2\pi k$$

$$\theta = \frac{\pi}{6} + 2\pi k$$

$$\theta = \frac{3\pi}{2} + 2\pi k$$

$$\theta = \frac{5\pi}{6} + 2\pi k$$

Example

Verify the identity.

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

$$\frac{1}{\sin 2\theta}$$

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

$$\frac{1}{2} \cdot \frac{1}{\sin \theta} \cdot \frac{1}{\cos \theta}$$

$$\frac{\csc \theta}{2 \cos \theta}$$