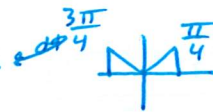


: Trig Equations with Multiple Angles

Solve each equation for $0 \leq \theta < 2\pi$.

1) $\csc 2\theta = \sqrt{2}$ 

$$\frac{2\theta}{2} = \frac{\pi/4 + 2\pi n}{2}, \frac{3\pi/4 + 2\pi n}{2}$$

$$\theta = \frac{\pi}{8} + \pi n, \frac{3\pi}{8} + \pi n$$

$$\theta = \frac{\pi}{8}, \frac{9\pi}{8}, \frac{3\pi}{8}, \frac{11\pi}{8}$$

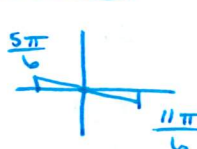
2) $\tan 2\theta = \sqrt{3}$



$$\frac{2\theta}{2} = \frac{\pi/3 + \pi n}{2}$$

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

$$\theta = \frac{\pi}{6}, \frac{4\pi}{6}, \frac{7\pi}{6}, \frac{10\pi}{6}$$

3) $\tan \frac{\theta}{2} = -\frac{\sqrt{3}}{3}$ 

4) $\cos 3\theta = 1$

$$\theta = \frac{\pi}{6}, \frac{2\pi}{3}, \frac{7\pi}{6}, \frac{5\pi}{3}$$



$$\frac{3\theta}{3} = \frac{0 + 2\pi n}{3}$$


$$\theta = \frac{2\pi}{3} n$$

$$\theta = 0, \frac{2\pi}{3}, \frac{4\pi}{3}$$

$$2\left(\frac{1}{2}\theta\right) = \left(\frac{5\pi}{6} + \pi n\right) 2$$

$$\theta = \frac{5\pi}{3} + 2\pi n$$

$$\theta = \frac{5\pi}{3}$$

5) $\sin 4\theta = \frac{\sqrt{2}}{2}$ 

6) $\tan 2\theta = \frac{\sqrt{3}}{3}$

$$\tan(2\theta) = \frac{1}{\sqrt{3}}$$
 

$$\frac{4\theta}{4} = \frac{\pi/4 + 2\pi n}{4}, \frac{3\pi/4 + 2\pi n}{4}$$

$$\frac{2\theta}{2} = \frac{\pi/6 + \pi n}{2}$$

$$\theta = \frac{\pi}{12} + \frac{\pi}{2} n$$


$$\theta = \frac{\pi}{16} + \frac{\pi}{2} n, \frac{3\pi}{16} + \frac{\pi}{2} n$$

$$\theta = \frac{\pi}{16}, \frac{9\pi}{16}, \frac{13\pi}{16}, \frac{25\pi}{16}, \frac{3\pi}{16}, \frac{11\pi}{16}, \frac{19\pi}{16}, \frac{27\pi}{16}$$

$$\theta = \frac{\pi}{12}, \frac{7\pi}{12}, \frac{13\pi}{12}, \frac{19\pi}{12}$$

7) $6\cot 2\theta = 2\sqrt{3}$

8) $6 = 3\sec \frac{\theta}{2}$

$$\cot(2\theta) = \frac{\sqrt{3}}{3} = \frac{1}{\sqrt{3}}$$
 

$$\frac{2}{1} = \sec\left(\frac{1}{2}\theta\right)$$
 

$$\frac{2\theta}{2} = \frac{\pi/3 + \pi n}{2}$$

$$2\left(\frac{1}{2}\theta\right) = \left(\frac{\pi}{3} + \pi n\right) 2, \left(\frac{5\pi}{3} + 2\pi n\right) 2$$

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

$$\theta = \frac{2\pi}{3} + 4\pi n, \frac{10\pi}{3} + 4\pi n$$

$$\theta = \frac{\pi}{6}, \frac{4\pi}{6}, \frac{7\pi}{6}, \frac{10\pi}{6}$$


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

$$\theta = \frac{\pi}{6}, \frac{2\pi}{3}, \frac{7\pi}{6}, \frac{5\pi}{3}$$

Find the general solution

9) $-4 + 4\sin \frac{\theta}{4} = 0$

$4\sin(\frac{1}{4}\theta) = 4$
 $\sin(\frac{1}{4}\theta) = 1$

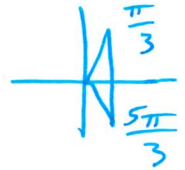


$4(\frac{1}{4}\theta) = (\frac{\pi}{2} + \pi n) \cdot 4$

$\theta = 2\pi + 4\pi n$

10) $-5 = -3 - 4\cos 2\theta$

$-2 = -4\cos(2\theta)$
 $\frac{1}{2} = \cos(2\theta)$




$2\theta = \frac{\pi}{3} + 2\pi n, \frac{5\pi}{3} + 2\pi n$

$\theta = \frac{\pi}{6} + \pi n, \frac{5\pi}{6} + \pi n$

11) $0 = -1 - 2\cos 2\theta$

$1 = -2\cos(2\theta)$
 $-\frac{1}{2} = \cos(2\theta)$




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

$\theta = \frac{\pi}{3} + \pi n, \frac{2\pi}{3} + \pi n$

12) $1 + 3\sin 4\theta = 1$

$3\sin(4\theta) = 0$
 $\sin(4\theta) = 0$

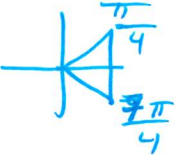


$4\theta = 0 + \pi n$

$\theta = \frac{\pi}{4} n$

13) $\frac{\sqrt{2}}{2} = \cos \frac{\theta}{4}$

$\cos(\frac{1}{4}\theta) = \frac{1}{\sqrt{2}}$



$4(\frac{1}{4}\theta) = (\frac{\pi}{4} + 2\pi n), (\frac{7\pi}{4} + 2\pi n) \cdot 4$

$\theta = \pi + 8\pi n, 7\pi + 8\pi n$

14) $-2 + \tan 2\theta = -2$

$\tan(2\theta) = 0$

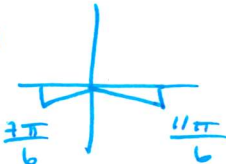


$2\theta = 0 + \pi n$

$\theta = \frac{\pi}{2} n$

15) $-2 = 2 + 8\sin 3\theta$

$-4 = 8\sin(3\theta)$
 $-\frac{1}{2} = \sin(3\theta)$



$3\theta = \frac{7\pi}{6} + 2\pi n, \frac{11\pi}{6} + 2\pi n$

$\theta = \frac{7\pi}{18} + \frac{2\pi}{3} n, \frac{11\pi}{18} + \frac{2\pi}{3} n$

16) $\frac{1}{5} \cdot \cos 4\theta = -\frac{1}{5}$

$\cos(4\theta) = -1$



$4\theta = \pi + 2\pi n$

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