

# Solutions

$$1. \frac{2 \cos(3x)}{2} = \frac{1}{2}$$

$$\cos(3x) = \frac{1}{2}$$

$$3x = \cos^{-1}\left(\frac{1}{2}\right)$$

$$\Rightarrow \frac{3x}{3} = \frac{60^\circ}{3}$$

$$\underline{x = 20^\circ} \quad \text{or}$$

Extra Solutions

$$x = 20 + 120$$

$$\underline{x = 140^\circ}$$

$$x = 140 + 120$$

$$\underline{x = 260^\circ}$$

$$\text{Period} = \frac{360}{k}$$

$$= \frac{360}{3}$$

$$= 120^\circ$$

$$\frac{3x}{3} = \frac{300^\circ}{3}$$

$$\underline{x = 100^\circ}$$

$$x = 100 + 120$$

$$\underline{x = 220^\circ}$$

$$x = 220 + 120$$

$$\underline{x = 340^\circ}$$

$$2. \quad \frac{2 \sin\left(\frac{x}{2}\right)}{2} = \frac{-1}{2}$$

$$\sin\left(\frac{x}{2}\right) = -\frac{1}{2}$$

$$\frac{x}{2} = \sin^{-1}\left(-\frac{1}{2}\right)$$

$$\frac{x}{2} = -30^\circ$$

$$\Rightarrow \frac{x}{2} = 330^\circ \quad \text{OR}$$

$$\frac{x}{2} = 210^\circ$$

$$x = 420^\circ$$

$$x = 660^\circ$$

These are outside of  $0 \leq x \leq 360$

$\Rightarrow$  Subtract the period

$$x = 660 - 720 \quad \text{OR} \quad x = 420 - 720$$

$$x = -60^\circ$$

$$x = -300^\circ$$

$\Rightarrow$  NO SOLUTIONS

$$3. \quad 4 \sin(2x) - 3 = 0$$

$$= \frac{4 \sin(2x)}{4} = \frac{3}{4}$$

$$\sin(2x) = \frac{3}{4}$$

$$2x = \sin^{-1}\left(\frac{3}{4}\right)$$

$$\frac{2x}{2} = \frac{48.6^\circ}{2} \quad \text{OR}$$

$$\frac{2x}{2} = \frac{131.4^\circ}{2}$$

$$x = \underline{\underline{24.3^\circ}}$$

$$x = \underline{\underline{65.7^\circ}}$$

Extra  
Solutions  $x = 24.3 + 180$   
 $x = \underline{\underline{204.3^\circ}}$

$$x = 65.7 + 180$$

$$x = \underline{\underline{245.7^\circ}}$$

$$4. \quad \frac{3 \sin(2x)}{3} = \frac{-3}{3}$$

$$\sin(2x) = -1$$

$$2x = \sin^{-1}(-1)$$

$$\frac{2x}{2} = \frac{270}{2}$$

$$\underline{x = 135^\circ}$$

Extra Solution  $x = 135 + 180$   
 $\underline{x = 315^\circ}$

$$\begin{aligned} \text{Period} &= \frac{360}{k} \\ &= \frac{360}{2} \\ &= 180^\circ \end{aligned}$$

$$5. \quad 4 \cos(4x) - 1 = 3$$

$$\frac{4 \cos(4x)}{4} = \frac{4}{4}$$

$$\cos(4x) = 1$$

$$4x = \cos^{-1}(1)$$

$$\frac{4x}{4} = \frac{0}{4} \quad \text{or} \quad \frac{4x}{4} = \frac{360}{4}$$

$$\underline{x = 0^\circ}$$

$$\underline{x = 90^\circ}$$

Extra Solutions  $x = 0 + 90$   
 $x = 90^\circ$

$$\begin{aligned} x &= 90 + 90 \\ x &= 180^\circ \end{aligned}$$

$$\begin{aligned} x &= 180 + 90 \\ x &= 270^\circ \end{aligned}$$

$$\begin{aligned} x &= 90 + 90 \\ x &= 180^\circ \end{aligned}$$

$$\begin{aligned} x &= 180 + 90 \\ x &= 270^\circ \end{aligned}$$

$$\begin{aligned} x &= 270 + 90 \\ x &= 360^\circ \end{aligned}$$

$$\begin{aligned} \text{Period} &= \frac{360}{k} \\ &= \frac{360}{4} \\ &= 90^\circ \end{aligned}$$

6.  $4 \sin(3x) - \sqrt{3} = \sqrt{3}$

$$\frac{4 \sin(3x)}{4} = \frac{2\sqrt{3}}{4}$$

$$\sin(3x) = \frac{\sqrt{3}}{2}$$

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

$$\frac{3x}{3} = \frac{60^\circ}{3} \quad \text{or}$$

$$\underline{\underline{x = 20^\circ}}$$

Extra  
Solutions  $x = 20 + 120$

$$\underline{\underline{x = 140^\circ}}$$

$$x = 140 + 120$$

$$\underline{\underline{x = 260^\circ}}$$

$$\text{Period} = \frac{360}{k}$$

$$= \frac{360}{3}$$

$$= 120^\circ$$

$$\frac{3x}{3} = \frac{120^\circ}{3}$$

$$\underline{\underline{x = 40^\circ}}$$

$$x = 40 + 120$$

$$\underline{\underline{x = 160^\circ}}$$

$$x = 160 + 120$$

$$\underline{\underline{x = 280^\circ}}$$