

Solving Trig Equations with Double and Half Angles Examples

Solve over the interval $[0, 2\pi)$.

□ 1) $2\cos x + \sin 2x = 0$

$$\underline{2\cos x} + \underline{2\sin x \cdot \cos x} = 0$$

$$2\cos x (1 + \sin x) = 0$$

$$2\cos x = 0 \quad 1 + \sin x = 0$$

$$\cos x = 0 \quad \sin x = -1$$

$$x = \frac{\pi}{2}, \frac{3\pi}{2}$$

Solve over the interval $[0, 2\pi)$.

□ 2) $\cos 2x - 7\cos x = 3$

$$\cos^2 x - \sin^2 x - 7\cos x = 3$$

$$\cos^2 x - (1 - \cos^2 x) - 7\cos x = 3$$

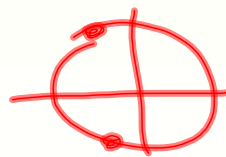
$$\cos^2 x - 1 + \cos^2 x - 7\cos x = 3$$

$$2\cos^2 x - 7\cos x - 4 = 0$$

$$(2\cos x + 1)(\cos x - 4) = 0$$

$$\cos x = -\frac{1}{2} \quad \cancel{\cos x = 4}$$

$$x = \frac{2\pi}{3}, \frac{4\pi}{3}$$



Solving Trig Equations with Double and Half Angles Examples

Solve over the interval $[0, 2\pi)$.

$$\square 3) \quad 2\left(\sin\frac{\theta}{2}\right) - \sin\theta = 0$$

$$\left(2 \cdot \sqrt{\frac{1-\cos\theta}{2}}\right)^2 = (\sin\theta)^2$$

$$2 \cancel{4} \left(\frac{1-\cos\theta}{\cancel{2}}\right) = (\sin^2\theta)$$

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

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

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

$$\cos\theta = 1$$

$$\theta = 0^\circ$$

Solve over the interval $[0, 2\pi)$.

$$\square 4) \quad \tan\frac{x}{2} = \sin x$$

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

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

$$1 - \cos x = 1 - \cos^2 x$$

$$\cos^2 x - \cos x = 0$$

$$\cos x (\cos x - 1) = 0$$

$$\cos x = 0 \quad \cos x = 1$$

$$x = \frac{\pi}{2}, \frac{3\pi}{2}, 0$$