

Solution:

3

$$\cos x + \cos \frac{x}{2} + 1 = 0$$

$$\cos\left(2 \cdot \frac{x}{2}\right) + \cos \frac{x}{2} + 1 = 0$$

$$\cos^2 \frac{x}{2} - \sin^2 \frac{x}{2} + \cos \frac{x}{2} + 1 = 0$$

$$2 \cos^2 \frac{x}{2} - \cancel{\sin^2 \frac{x}{2}} + \cos \frac{x}{2} + \cancel{1} = 0$$

$$\cos \frac{x}{2} (2 \cos \frac{x}{2} + 1) = 0$$

$$\cos \frac{x}{2} = 0 \quad \rightarrow \quad \frac{x}{2} = \frac{\pi}{2} + k\pi \quad \rightarrow \quad x = \pi + 2k\pi$$

$$\cos \frac{x}{2} = -\frac{1}{2} \quad \rightarrow \quad \frac{x}{2} = \frac{2\pi}{3} + 2k\pi \quad \rightarrow \quad x = \frac{4\pi}{3} + 4k\pi$$

$$\frac{x}{2} = \frac{4\pi}{3} + 2k\pi \quad \rightarrow \quad x = \frac{8\pi}{3} + 4k\pi$$