Solving Trig Equations

1. $4\cos^2 x - 3 = 0$
2. $\sqrt{2}\sin(2x) = 1$
3. $\cos^3\left(\frac{x}{2}\right) = \cos\left(\frac{x}{2}\right)$
4. $\sin x - 2\sin x\cos x = 0$
5. $2\sin^2 x - \sin x - 3 = 0$
6. $5\cos x - \sqrt{3} = 3\cos x$
7. $1 - \cos^2 x - 5\cos x = 5$
8. $5\cos(2x) + 1 = 3\cos(2x)$

(7) $1 - \cos^2 x - 5\cos x = 5$

$0 = \cos^2 x + 5\cos x + 4$

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

$0 = \cos x + 4$ $\quad 0 = \cos x + 1$

$-4 = \cos x$ $\quad -1 = \cos x$

no solution b/c angles do not have cosines less than -1.

$\pi = x$

(8) $5\cos(2x) + 1 = 3\cos(2x)$

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

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

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

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

(1) $4\cos^2 x - 3 = 0$

$\cos^2 x = \frac{3}{4}$

$\cos x = \pm\sqrt{\frac{3}{4}}$

$\cos x = \pm\frac{\sqrt{3}}{2}$

$x = \frac{\pi}{6}, \frac{5\pi}{6}$

(2) $\sqrt{2}\sin(2x) = 1$

$\sin(2x) = \frac{1}{\sqrt{2}}$

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

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

$x = \frac{\pi}{8}$

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

$\cos^3\left(\frac{x}{2}\right) - \cos\left(\frac{x}{2}\right) = 0$

$\cos\left(\frac{x}{2}\right)\left[\cos^2\left(\frac{x}{2}\right) - 1\right] = 0$

$\cos\left(\frac{x}{2}\right) = 0$ $\quad \cos^2\left(\frac{x}{2}\right) - 1 = 0$

$\frac{x}{2} = \frac{\pi}{2}$ $\quad \cos^2\left(\frac{x}{2}\right) = 1$

$x = \pi$ $\quad \cos\left(\frac{x}{2}\right) = \pm 1$

$\frac{x}{2} = 0$ $\quad \frac{x}{2} = \pi$

$x = 0$ $\quad x = 2\pi$

(4) $\sin x - 2\sin x\cos x = 0$

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

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

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

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

(5) $2\sin^2 x - \sin x - 3 = 0$

$(2\sin x - 3)(\sin x + 1) = 0$

$2\sin x - 3 = 0$ $\quad \sin x + 1 = 0$

$\sin x = \frac{3}{2}$ $\quad \sin x = -1$

$x = -\frac{\pi}{2}$

no solution b/c 3/2 is greater than 1 and angles do not have sines or cosines greater than 1 or less than -1.

(6) $5\cos x - \sqrt{3} = 3\cos x$

$5\cos x - 3\cos x = \sqrt{3}$

$2\cos x = \sqrt{3}$

$\cos x = \frac{\sqrt{3}}{2}$

$x = \pi/6$

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