MORE TRIG EQUATIONS

Square both sides — Must check answers!

$$(2\sin x)^2 = (1 - 2\cos x)^2 \quad [0°, 360°)$$

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

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

$$\sqrt{x+3} = 2 - \sqrt{x+4}$$

$$4\sin^2 x = 1 - 4\cos x + 4\cos^2 x$$

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

$$4 - 4\cos^2 x = 1 - 4\cos x + 4\cos^2 x$$

$$0 = 8\cos^2 x - 4\cos x - 3$$

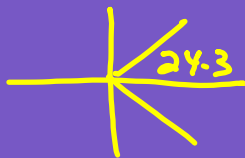$$\cos x = \frac{4 \pm \sqrt{16 - 4(8)(-3)}}{2(8)} = \frac{4 \pm \sqrt{112}}{16}$$

$$\cos x = 0.911$$
$$\cos^{-1}(0.911) = 24.3$$

$$\cos x = -0.41$$
$$\cos(0.411) = 65.7°$$

Check!

24.3

65.7 / 65.7

$$\theta = \cancel{24.3°}, 335.7°, 115.3°, \cancel{244.7°}$$

$[0, 2\pi)$

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

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

$$\sin x - 1 + 2\sin^2 x = 0$$

$$2\sin^2 x + \sin x - 1 = 0$$

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

$$\sin x = 1/2 \qquad \sin x = -1$$

$\pi/6 \qquad \pi/6$

$$\boxed{x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}}$$

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

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

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

$$\sin x = \cos\left(\frac{x}{2}\right) \qquad [0°, 360°)$$

$$\left(\sin x\right)^2 = \left(\pm\sqrt{\frac{1+\cos x}{2}}\right)^2 \leftarrow \underline{Check!}$$

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

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

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

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

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

$$\cos x = 1/2 \qquad \cos x = -1$$

$$\sin 60° = \cos 30°$$
$$\frac{\sqrt{3}}{2} = \frac{\sqrt{3}}{2} \checkmark$$

$$\sin 300° = \cos 150°$$
$$-\frac{\sqrt{3}}{2} = -\frac{\sqrt{3}}{2} \checkmark$$

$$\sin 180° = \cos 90°$$
$$0 = 0$$

$$\boxed{x = 60°, 300°, 180°}$$

$[0, 2\pi)$ $2\tan\left(\frac{x}{2}\right) + \sqrt{3} = -\tan\left(\frac{x}{2}\right)$

$$3\tan\left(\frac{x}{2}\right) + \sqrt{3} = 0$$

$$\tan\left(\frac{x}{2}\right) = -\frac{\sqrt{3}}{3}$$

$\pi/6$ ~~$\pi/6$~~

2. $\frac{x}{2} = \frac{5\pi}{6}$

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

Shortcut

:Do not use Identities

1) All same trig func

2) All same multiple angle

$0 < x < 2\pi$

$0 < \frac{x}{2} < \pi$

$$2\cos^2 3\theta + 3\cos 3\theta + 1 = 0 \quad [0°, 360°)$$

$$(2\cos 3\theta + 1)(\cos 3\theta + 1) = 0$$

$$\cos 3\theta = -\frac{1}{2} \qquad \cos 3\theta = -1 \qquad \theta = [0°, 360°)$$
$$3\theta = [0°, 1080°)$$

$$3\theta = 120°, \frac{180°}{3}, \frac{240°}{3}$$
$$480°, 540°, 600°$$
$$840°, 900°, 960°$$

$$\boxed{\theta = 40°, 60°, 80° \\ 160°, 180°, 200° \\ 280°, 300°, 320°}$$

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