

Solving Trigonometric Equations With More Than 2 solutions

These are equations where you no longer have a single x term but one where there is a coefficient in front of the x . Again these equations are dealt with like the brackets, we make sure we deal with the x term last, but it does bring up a different problem which is related to the number of solutions that the equation will generate.

Example 1: Find the solution to $4 \cos 2x - 1 = 2$ for $0 \leq x \leq 2\pi$

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

$$4 \cos 2x = 3$$

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

$$2x = 0.7227 \text{ rads}$$

cos is positive in quadrants 1 and 4

$$\text{Q1} \quad 2x = 0.7227$$

$$x = 0.3614 \text{ rads}$$

$$\text{Q4} \quad 2x = 2\pi - 0.7227$$

$$2x = 5.5605$$

$$x = 2.7802 \text{ rads}$$

This is not the final answer because the period is π

$$\cos 2x \quad \text{period} = \frac{2\pi}{2} = \pi$$

The number in front of the x also tells us how many solutions there will be within any 2π or 360° range

so for $\cos 2x$ we would be looking for 4 solutions

$$0.3614 + \pi = 3.50299$$

$$2.7802 + \pi = 5.9218$$

\therefore The solutions are 0.3614, 2.7802, 3.50299, 5.9218

Always check for how many solutions you need (remember this is for a 2π or 360° range)

$$\sin 3x = 6 \text{ solutions}$$

$$\cos 4x = 8 \text{ solutions}$$

$$\cos \frac{1}{2}x = 1 \text{ solutions}$$