5.4 Equations and Graphs of Trigonometric Functions

We were introduced to solving trigonometric equations in section 4.4. We will continue our study of solving trigonometric equations in section 5.4.

In this section we will solve trigonometric equations both **graphically** and **algebraically.**

Example 1:
Solve the trigonometric equation $2cos\theta - 1 = 0$ graphically and algebraically for the interval $0° \leq \theta \leq 360°$.

Graphical solution:

Graph the function : $y = 2\cos\theta - 1$

Then find the θ-intercepts.

↳ $\frac{\pi}{3} = 60°$

↳ $\frac{5\pi}{3} = 300°$

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Algebraic Solution:

$2cos\theta - 1 = 0$ (isolate cos θ)

$2\cos\theta = 1$

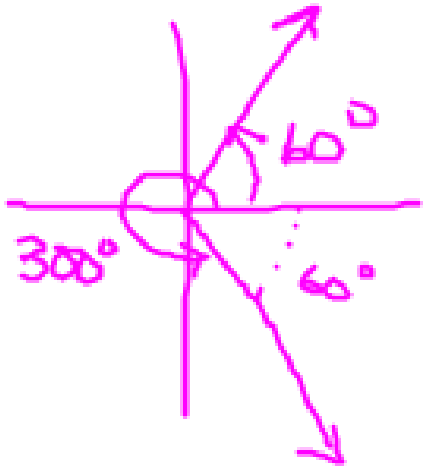
$\cos\theta = \frac{1}{2}$ ← positive value ⇒

S	A
T	C

$\theta_R = 60°$

Q1 soln = 60°

Q4 soln = 300°



Example 2:

Solve: $2\cos^2 x - 1 = 0 \qquad 0^\circ \le x \le 360^\circ$

(isolate $\cos^2 x$)

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

($\sqrt{\ }$) $$\sqrt{\cos^2 x} = \pm\sqrt{\frac{1}{2}}$$

$$\cos x = \pm \frac{1}{\sqrt{2}}$$

} one solution in every quadrant

ref $\angle = 45^\circ$

Q1 $\Rightarrow x = 45^\circ$ Q3 $\rightarrow x = 225^\circ$

Q2 $\rightarrow x = 135^\circ$ Q4 $\rightarrow x = 315^\circ$

You Try:

Solve: $4\sin^2 x - 3 = 0 \qquad 0^\circ \le x \le 360$

$\text{ref } \angle = 60^\circ \qquad \sin x = \pm \frac{\sqrt{3}}{2}$

Q1 $\Rightarrow x = 60^\circ$

Q2 $\Rightarrow x = 120^\circ$

Q3 $\Rightarrow x = 240^\circ$

Q4 $\Rightarrow x = 300^\circ$