week of Nationals

22 may 2023

(ex) $\sin(2x) = 2$

→ has no solution because the range of sin is $[-1, 1]$ and 2 is out of that range

(ex) $\cos(2x) - 2\cos x = -\frac{3}{2}$ $\quad x \in [0, 5\pi]$

$\underbrace{\cos(2x) = 2\cos^2 x - 1}_{\text{plug into equation}}$ → DA identity

$2\cos^2 x - 1 - 2\cos x = -3/2$

Let $t = \cos x$ → $2t^2 - 1 - 2t = -3/2$

$+1 \qquad +1$

→ $(2t^2 - 2t = -1/2)\,2$ → $4t^2 - 4t = -1$

$4t^2 - 4t + 1 = 0$

$at^2 + bt + c = 0$

$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

→ $\frac{4 \pm \sqrt{-4^2 - 4(4)(1)}}{2(4)}$

$t = \frac{1}{2}$, solve for x

$\cos(x) = 1/2$

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

$\cos x = \cos \pi/3$

$x = \pm \pi/3 + k2\pi$

$\pi/3, \frac{7\pi}{3}, \frac{13\pi}{3}$

$-\frac{5\pi}{3}, -11\pi/3$