When solving an equation, pay attention to the period. e.g.

\[ 2 \tan x + 1 = 3 \]

\[ \Rightarrow \tan x = 1. \]

Period of \( \tan x \) is \( \pi \), so consider solutions to \( \tan x = 1 \) for \( x \) between 0 and \( \pi \):

\[ \tan x = 1 \text{ for } x = \frac{\pi}{4}, \text{ when } 0 \leq x \leq \pi. \]

So general solution is \( x = \frac{\pi}{4} + \pi n \).

\[ \cos 4t = 1, \text{ period of } \cos x \text{ is } 2\pi, \text{ so}
\]

solve \( \cos 4t = 1 \) for \( 4t \) with \( 0 \leq 4t \leq 2\pi \)

Get \( 4t = 0 + 2\pi n \), so \( t = 0 + \frac{\pi n}{4} = 0 + \frac{\pi}{2} n = \frac{\pi}{2} n \).

**General Equation Reminders**

\[ x(x^2+1) = -x \]

\[ \Rightarrow x^2 + 1 = -1 \]

\[ \Rightarrow \text{no solution} \]

- B/c \( x = 0 \) is a solution.

- You can lose solutions when dividing by a variable, just as you can gain false solutions when multiplying by a variable.

  e.g. \( x^2 + 1 = -1 \), no solution,

  \[ \times (x^2 + 1) = -x \text{ has } x = 0 \text{ solution.} \]
Sum and Difference Formulas

"sin keeps its own sign.
\[
\sin(a \pm b) = \sin a \cos b \pm \cos a \sin b
\]

\[
\Rightarrow \sin(a-b) = \sin(a+(-b))
\]

\[
= \sin a \cos(-b) + \cos a \sin(-b)
\]

\[
= \sin a \cos b + - \cos a \sin b
\]

\[
= \sin a \cos b - \cos a \sin b
\]

\[
\text{by (3)}, \quad \cos(a \pm b) = \cos a \cos b \mp \sin a \sin b
\]

\[
\Rightarrow \cos(a-b) = \cos a \cos b + \sin a \sin b.
\]

- Don't memorize tan

Can now compute things like \(\sin(7\pi/12)\) by writing
\[
\sin(7\pi/12) = \sin(\pi/4 + \pi/3).
\]

\[\text{Ex} \quad \cos(\pi/6) \cos(3\pi/16) - \sin(\pi/6) \sin(3\pi/16)
\]

\[= \cos(\pi/6 + 3\pi/16) \quad \text{by (3)}
\]

\[= \cos(\pi/4) = \frac{\sqrt{2}}{2}.
\]

Can also verify identities such as
\[
\sin\left(\frac{\pi}{2} - x\right) = \cos x; \quad \sin\left(\frac{\pi}{2} - x\right) = \sin\frac{\pi}{2} \cos x - \cos\frac{\pi}{2} \sin x
\]

\[= \cos x - 0 \cdot \sin x = \cos x.
\]

Ex
\[
\tan(\arccos(\frac{1}{2}) - \arcsin(x))
\]

\[= \frac{\tan(\arccos(\frac{1}{2})) - \tan(\arcsinx)}{1 + \tan(\arccos(\frac{1}{2})) \cdot \tan(\arcsinx)} \quad \text{-- see Mar 14 notes end.}
\]