Simplifying Trig Expressions
and
Verifying Trig Identities

We did both activities ~~last~~ *at the beginning of this* semester ...
now we will just include our new
sum & difference identities!

Ex.1 - Simplify:

$$\sin\left(\frac{\pi}{2} - \theta\right) \overset{①\ \text{expansion}}{=} \sin\frac{\pi}{2} \cdot \cos\theta \ - \ \cos\frac{\pi}{2} \cdot \sin\theta$$

② substitution

$$= (\ 1\ )\cos\theta \ - \ (\ 0\ ) \cdot \sin\theta$$

(0,1)
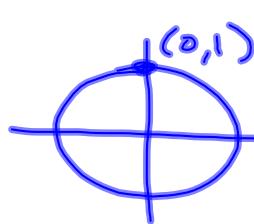
③ simplify

$$= \boxed{\cos\theta}$$

BTW ... $\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta$
is a cofunction identity !

Ex.2 - Simplify:

$$\cos\left(\frac{\pi}{6} - \theta\right) + \cos\left(\frac{\pi}{6} + \theta\right)$$

① expansion
② Substitution
③ simplify

$$= \left[\cos\frac{\pi}{6}\cos\theta + \sin\frac{\pi}{6}\sin\theta\right] + \left[\cos\frac{\pi}{6}\cos\theta - \sin\frac{\pi}{6}\sin\theta\right]$$

$$= \left(\frac{\sqrt{3}}{2}\right)\cdot\cos\theta + \left(\frac{1}{2}\right)\cdot\sin\theta + \left(\frac{\sqrt{3}}{2}\right)\cdot\cos\theta - \left(\frac{1}{2}\right)\sin\theta$$

$$= \frac{\sqrt{3}}{2}\cos\theta + \frac{\sqrt{3}}{2}\cos\theta$$

$$= 2\left(\frac{\sqrt{3}}{2}\cos\theta\right)$$

$$= \boxed{\sqrt{3}\cos\theta}$$

$\left(\frac{\sqrt{3}}{2},\frac{1}{2}\right)$
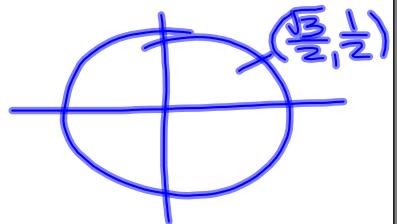
Ex.3 - Verify:

$$\tan(\pi - x) - \tan(\pi + x) = -2\tan x \quad \checkmark$$

$$= \left(\frac{\tan\pi - \tan x}{1 + \tan\pi\tan x}\right) - \left(\frac{\tan\pi + \tan x}{1 - \tan\pi\tan x}\right)$$

$$= \left(\frac{0 - \tan x}{1 + 0\cdot\tan x}\right) - \left(\frac{0 + \tan x}{1 - 0\cdot\tan x}\right)$$

$$= -\tan x - \tan x$$

$$= \boxed{-2\tan x}$$

$(-1,0)$

$\tan\pi = 0$