Objectives

$v(t) = \boxed{V_n \cos(\omega t + \phi)}$

$= A\cos(\omega t) - B\sin(\omega t)$

Frequencies

$2\cos(3t + \pi/2)$

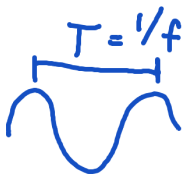
3 → angular freq. (frequency in rad/sec = ω)

$120\cos(\overbrace{120 \cdot 2\pi}^{\omega} t + \pi/4)$

120 → freq in Hz

$\boxed{\omega = 2\pi f}$

Time period $\boxed{T = \frac{1}{f}}$



Ex: Find time period of $2\cos(3t + \pi/2)$

Amp: 2

Phase: $\pi/2$ rads

$\omega = 3$

$f = \frac{\omega}{2\pi} = \frac{3}{2\pi}$

$T = \frac{1}{f} = \boxed{\frac{2\pi}{3} \text{ sec}}$

Phase

rads or degrees

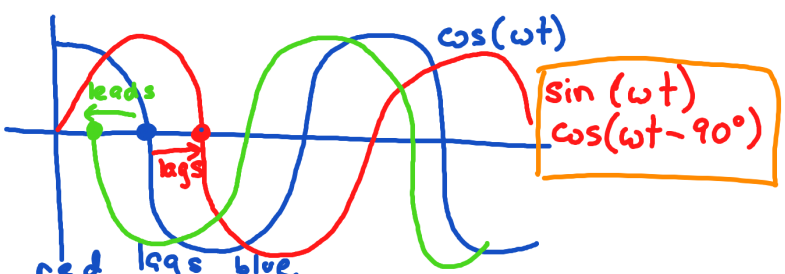
→ $\frac{180}{\pi}$ →

← $\frac{\pi}{180}$ ←

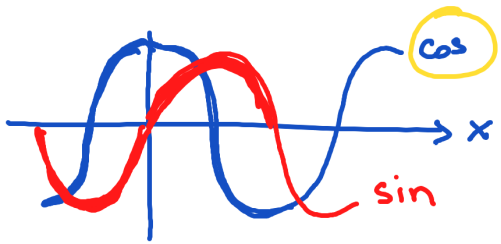
$\boxed{v(t) = 3\cos(2t + 30°)}$ engineer

$= 3\cos(2t + \pi/6)$ mathematician

Leading / Lagging phase



Cos vs Sin



$$\sin(x) = \cos(x - 90^\circ)$$

mem!

$$\cos(-x) = \cos(x)$$
$$\sin(-x) = -\sin(x)$$

Other trig ID

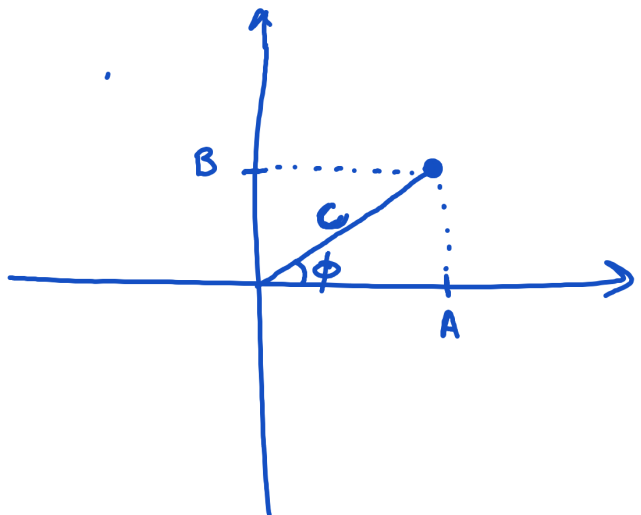
$$\cos(A \pm B) = \cos(A)\cos(B) \mp \sin(A)\sin(B)$$
$$\sin(A \pm B) = \sin(A)\cos(B) \pm \cos(A)\sin(B)$$

Polar	Rectangular
$C\cos(\omega t + \phi)$	$A\cos(\omega t) - B\sin(\omega t)$ ←

$$C = \sqrt{A^2 + B^2}$$

$$A = C\cos(\phi)$$
$$B = C\sin(\phi)$$

$$\phi = \tan^{-1}\left(\frac{B}{A}\right) \{+180^\circ \text{ if } A < 0\}$$



Ex $3\cos(7t) - 4\sin(7t) = 5\cos(7t + 53^\circ)$