$$\sum_{i=0}^{N} b_i \frac{d^i}{dt^i} v_o(t) \quad = \quad \sum_{i=0}^{M} a_i \frac{d^i}{dt^i} v_i(t)$$

$$v_i(t) = V_I \cos(\omega t)$$

Trig Identities (Review)

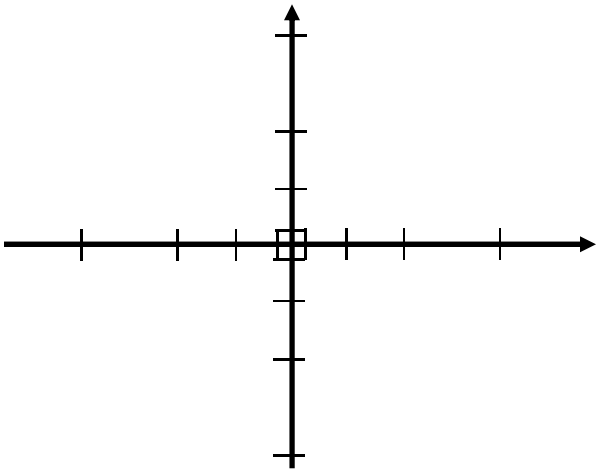
$$\sin(\theta) = \cos(\theta - 90°)$$
$$-\cos(\theta) = \cos(\theta \pm 180°)$$

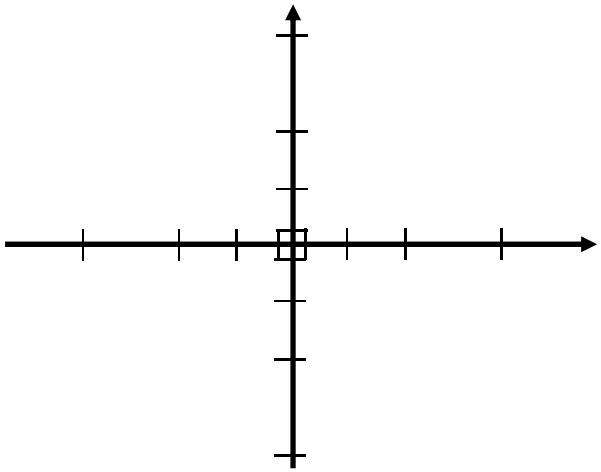
$$A\cos(\omega t) + B\sin(\omega t) = \sqrt{A^2 + B^2}\cos\left(\omega t - \tan^{-1}\left(\frac{B}{A}\right)\right)$$

$$Ae^{j\theta} = A\cos(\theta) + jA\sin(\theta)$$

Sinusoidal Steady State

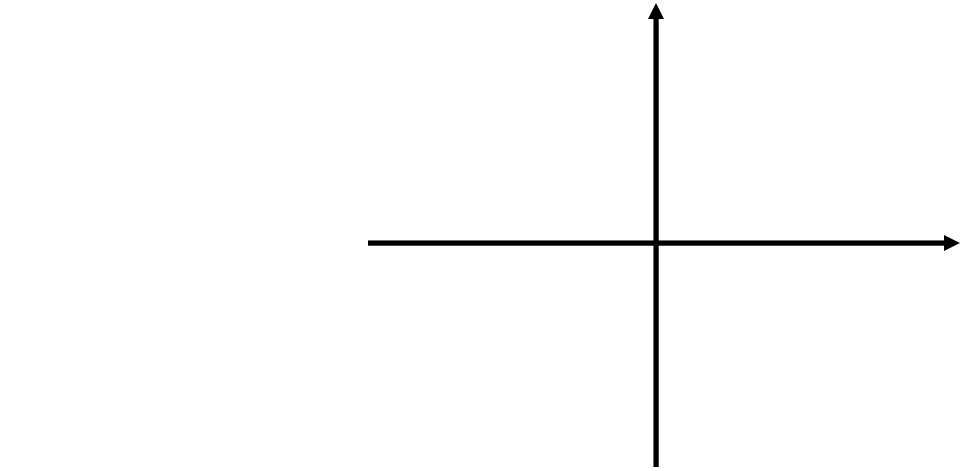
$$
\begin{aligned}
v(t) &= A\cos(\omega t + \varphi) &&= A\cos(\omega t + \varphi) \\
v'(t) &= -A\omega\sin(\omega t + \varphi) &&= A\omega\cos(\omega t + \varphi + 90°) \\
v''(t) &= -A\omega^2\cos(\omega t + \varphi) &&= A\omega^2\cos(\omega t + \varphi + 180°) \\
v'''(t) &= A\omega^3\sin(\omega t + \varphi) &&= A\omega^3\cos(\omega t + \varphi + 270°) \\
v'''(t) &= A\omega^4\cos(\omega t + \varphi) &&= A\omega^4\cos(\omega t + \varphi + 360°)
\end{aligned}
$$





Complex Numbers (Review)

Complex Number Arithmetic



Sinusoids as Complex Numbers