UNIVERSITY OF CALGARY

3.2: Velocity and acceleration in the complex representation

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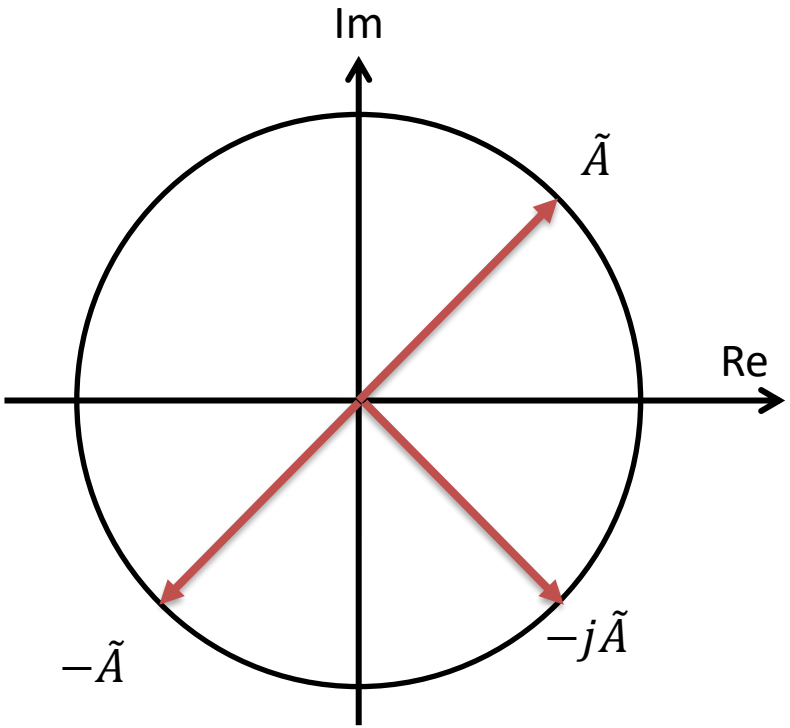
Complex representation of velocity and acceleration

$$\tilde{y}(x,t) = \tilde{A}e^{j(kx-\omega t)}$$

$$v_y = \frac{\partial \tilde{y}(x,t)}{\partial t} = -j\omega\tilde{A}e^{j(kx-\omega t)}$$

$$a_y = \frac{\partial^2 \tilde{y}(x,t)}{\partial t^2} = -\omega^2\tilde{A}e^{j(kx-\omega t)}$$

Where did that –j come from on $\tilde{A}$?



- Multiplication by -1 results in a 180° rotation in the complex plane
- Multiplication by –j results in a -90° rotation
- Differentiation leads to a -90° rotation
  - cos() → sin()