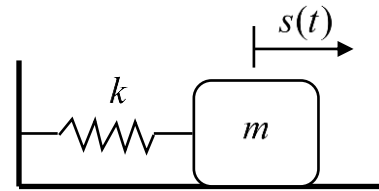


## ME 2580 Example #1: (Rectilinear Motion)

Given:  $s(t) = A_0 \sin(\omega_0 t)$  ... ( $A_0$  and  $\omega_0$  are constants)



Find:  $v(t)$  ... the velocity of  $m$

$a(t)$  ... the acceleration of  $m$

Solution:

$$v(t) = \frac{ds}{dt} = \frac{d}{dt}(A_0 \sin(\omega_0 t)) = A_0 (\cos(\omega_0 t)) \omega_0 = A_0 \omega_0 \cos(\omega_0 t)$$

$$a(t) = \frac{dv}{dt} = \frac{d}{dt}(A_0 \omega_0 \cos(\omega_0 t)) = A_0 \omega_0 (-\sin(\omega_0 t)) \omega_0 = -A_0 \omega_0^2 \sin(\omega_0 t)$$

Aside:

$$\frac{d}{dt}(\sin(\theta)) = \cos(\theta) \cdot \frac{d\theta}{dt}$$

$$\frac{d}{dt}(\cos(\theta)) = -\sin(\theta) \cdot \frac{d\theta}{dt}$$

chain rule