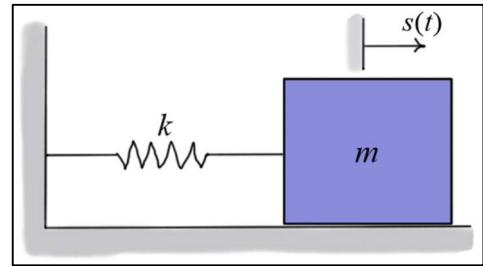


Elementary Dynamics – Example #1: (Rectilinear Motion)

Given: $s(t) = A_0 \sin(\omega_0 t)$... (A_0 and ω_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: (chain rule)

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

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