

$$y - \frac{1}{\omega^2} = -\frac{2}{\omega^3} (x - \omega)$$

plug in $(k, 0)$:

$$0 - \frac{1}{\omega^2} = -\frac{2}{\omega^3} (k - \omega)$$

$$k = \boxed{\quad} \omega$$

c) $\frac{d}{dt} (k = \boxed{\quad} \omega)$

$$\frac{dk}{dt} = \boxed{\quad} \frac{d\omega}{dt}$$