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$$\text{SE } \omega = \omega_0 - a\varphi \quad \text{E} \quad \varphi(t=0) = 0$$

$$\frac{d\varphi}{dt} = \omega_0 - a\varphi, \quad \frac{d\varphi}{\omega_0 - a\varphi} = dt$$

$$t = \int_0^t dt = \int_0^\varphi \frac{d\varphi}{\omega_0 - a\varphi}$$

CAMBIANDO
VARIABLE

$$\begin{aligned} u &= \omega_0 - a\varphi \\ du &= -a d\varphi \\ u(0) &= \omega_0 \quad u(\varphi) = \omega_0 - a\varphi \end{aligned}$$

$$t = -\frac{1}{a} \int_{\omega_0}^{\omega_0 - a\varphi} \frac{du}{u} = \frac{1}{a} \ln \left(\frac{\omega_0}{\omega_0 - a\varphi} \right)$$

ALLORA

$$\frac{\omega_0}{\omega_0 - a\varphi} = e^{at}, \quad \omega_0 e^{-at} = \omega_0 - a\varphi$$

$$\varphi = \frac{\omega_0}{a} (1 - e^{-at})$$

E DERIVANDO

$$\omega = \dot{\varphi} = \omega_0 e^{-at}$$