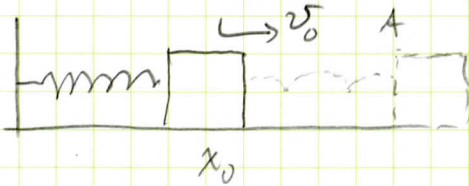


TMS Pr 3.3

TMS 3-3 A 100 g MASS ATTACHED TO A 10^4 DYNE/cm SPRING IS INITIALLY GIVEN $v = 1$ cm/s AT ITS EQUILIBRIUM POSITION.

- a) FIND A
b) FIND U_{MAX}



$$\begin{aligned} \text{NSL} \quad m\ddot{x} &= -kx \\ \text{DE} \quad \ddot{x} + \omega_n^2 x &= 0 \\ \text{SOL}^n \quad x &= A \cos(\omega_n t - \delta) \end{aligned}$$

APPLY INITIAL CONDITIONS

$$x(t=0) = 0 = A \cos(-\delta)$$

$$\Rightarrow \cos(-\delta) = 0 \Rightarrow -\delta = \frac{\pi}{2}$$

$$a) \quad \dot{x}(t=0) = \dot{x}_0 = \omega_n A \sin\left(\frac{\pi}{2}\right) = \omega_n A$$

$$\Rightarrow A = \frac{\dot{x}_0}{\omega_n} = \dot{x}_0 \sqrt{\frac{m}{k}} = (1) \sqrt{\frac{100}{10^4}}$$

$$\boxed{A = 0.1 \text{ cm}} \leftarrow \text{WERDIE!}$$

$$b) \quad U_{MAX} = \frac{1}{2} k A^2 = \frac{1}{2} (10^4) (0.1)^2$$

$$\boxed{U_{MAX} = 50 \text{ ERG}}$$