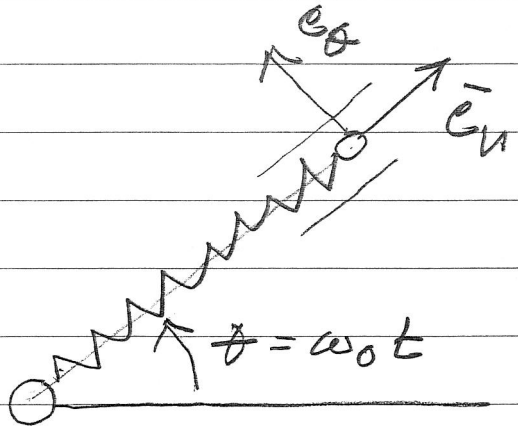
SG 1102

Problem 4



$$\bar{e}_r: \quad m(\ddot{r} - r\omega_0^2) = -k(r - r_0)$$

$$\ddot{r} + \left(\frac{k}{m} - \omega_0^2\right) r = \frac{k r_0}{m}$$

$$\frac{k}{m} = \frac{3\omega_0^2}{4} \Rightarrow$$

$$\ddot{r} - \frac{\omega_0^2}{4} r = \frac{3\omega_0^2 r_0}{4}, \quad \text{BV: } r(0) = r_0, \; \dot{r}(0) = -r_0\omega_0$$

$$r = -3r_0 + Ae^{\omega_0 t/2} + Be^{-\omega_0 t/2}$$

$$\text{BV} \Rightarrow \quad -3r_0 + A + B = r_0$$

$$\frac{\omega_0}{2}(A - B) = -r_0\omega$$

$$A = r_0, \quad B = 3r_0$$

$$r = r_0(-3 + e^{\omega_0 t/2} + 3e^{-\omega_0 t/2})$$

$$\dot{r} = \frac{r_0\omega_0}{2}(e^{\omega_0 t/2} - 3e^{-\omega_0 t/2}) = 0 \quad \text{f.}$$

$$t = \frac{1}{\omega_0} \ln 3$$