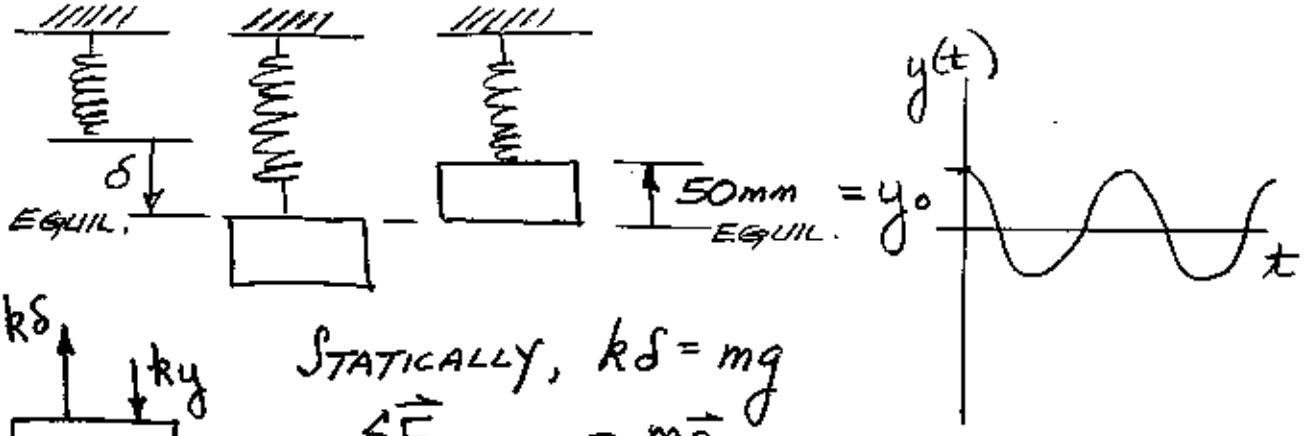
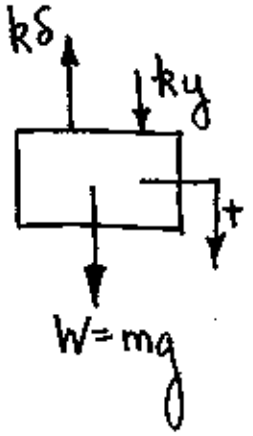
SPRING STIFFNESS, $k = 800\ N/m$

A 2-kg block IS ATTACHED AND PUSHED 50mm ABOVE THE EQUIL. PT. AND RELEASED

ASSUME ↓+ ? EQ. OF MOTION.





STATICALLY, $k\delta = mg$

$$\Sigma \vec{F}_{on\ mass} = m\vec{a}$$

$$-k\delta + ky + mg = -m\ddot{y}$$

$$m\ddot{y} + ky = 0$$

$$mD^2 + kD^0 = 0$$

$$D^2 + \frac{k}{m} = 0 \quad \therefore D = \pm\sqrt{\frac{k}{m}}\,\hat{j}$$

IMAGINERY ROOTS PRODUCE HARMONIC EQ.

$$y(t) = A \sin\sqrt{\frac{k}{m}}\,t + B\cos\sqrt{\frac{k}{m}}\,t$$

at $t=0$, $y_o = 0 + B \quad \therefore \boxed{B = y_o = -50mm}$

$$\frac{d}{dt}y = \text{Velocity}_o = 0 = A\sqrt{\frac{k}{m}}\cos\sqrt{\frac{k}{m}}\,t - B\sqrt{\ }\sin\sqrt{\ }t$$

$$\therefore A = 0$$

EQ. OF MOTION = $y(t) = B\cos\omega_n t$

$$\omega_n = \sqrt{\frac{800\ \frac{kg\,m}{s^2 m}}{2kg}} = 20\ \frac{rad}{sec.} \quad \therefore y(t) = -50\cos 20t\ mm.$$