1A. A block of mass 0.5 kg sits on a frictionless table. It is attached to a wall with a spring whose spring constant is 5.0 N/m. Initially the spring is neither stretched nor compressed. At t=0 the mass is given a velocity of 0.5 m/s to the right. (a) Find the maximum deflection from the equilibrium position. (b) Find the maximum potential energy of the system. (c) Find the angular frequency, the frequency, and the period of the oscillation.

(q) \[ E_{\text{tot}} = K + U \quad \text{(Conservation of energy)} \] 
Initially spring at equilibrium so: \[ E_{\text{tot}} = K_0 = \frac{1}{2} m v_0^2 \]
In general \[ E_{\text{tot}} = \frac{1}{2} m v^2 + \frac{1}{2} kx^2 = V_A K A^2 \Rightarrow v_{\text{max}} = \sqrt{\frac{m}{K}} v_0 \]
\[ y_{\text{max}} = \frac{1}{5} \left( \frac{5.5}{2} \right) = 0.158 \text{ meter} \]

(b) \[ U_{\text{max}} = \frac{1}{2} k x_{\text{max}}^2 = \frac{1}{2} \left( 5 \text{ N/m} \right) \left( 0.158 \text{ m} \right)^2 = (0.0624 \text{ J}) \]
Also \[ U_{\text{max}} = K_{\text{max}} = \frac{1}{2} m v_{\text{max}}^2 = \frac{1}{2} m v_0^2 = \frac{1}{2} \left( 5 \text{ kg} \right) \left( 0.5 \text{ m/s} \right)^2 = 0.625 \text{ J} \]

(c) \[ \omega = \sqrt{\frac{k}{m}} = \sqrt{\frac{5 \text{ N/m}}{0.5 \text{ kg}}} = \sqrt{10 \text{ rad/s}} = \sqrt{10 \text{ rad/s}} = 3.162 \text{ rad/s} \]

(f) \[ v = \frac{\omega}{2\pi} = \frac{3.162 \text{ rad/s}}{2\pi} = 0.503 \text{ m/s} \]
\[ T = \frac{1}{2 \pi} = \frac{1}{1.987 \text{ sec}} = 1.0187 \text{ sec} \]

Average 23.2