

3. (a) The motion repeats every 0.500 s so the period must be  $T = 0.500$  s.
- (b) The frequency is the reciprocal of the period:  $f = 1/T = 1/(0.500 \text{ s}) = 2.00$  Hz.
- (c) The angular frequency  $\omega$  is  $\omega = 2\pi f = 2\pi(2.00 \text{ Hz}) = 12.57 \text{ rad/s}$ .
- (d) The angular frequency is related to the spring constant  $k$  and the mass  $m$  by  $\omega = \sqrt{k/m}$ . We solve for  $k$ :  $k = m\omega^2 = (0.500 \text{ kg})(12.57 \text{ rad/s})^2 = 79.0 \text{ N/m}$ .
- (e) Let  $x_m$  be the amplitude. The maximum speed is  $v_m = \omega x_m = (12.57 \text{ rad/s})(0.350 \text{ m}) = 4.40 \text{ m/s}$ .
- (f) The maximum force is exerted when the displacement is a maximum and its magnitude is given by  $F_m = kx_m = (79.0 \text{ N/m})(0.350 \text{ m}) = 27.6 \text{ N}$ .