1. A mass of \( m = 6.00 \text{ kg} \) is attached to a spring of spring constant \( k = 3000 \text{ N/m} \). The mass can slide along a frictionless, horizontal surface. The mass is pulled to stretch the spring by an amount \( x = 3.00 \text{ cm} \) and the mass is thrown to the right with at \( v_0 = 60.0 \text{ cm/s} \).
(a) Find the angular frequency of the SHM.
(b) Find the period of the SHM.
(c) Find the frequency of the SHM.
(d) Find the total mechanical energy of the system.
(e) Find the amplitude of the SHM.
(h) Find the speed of the mass when it passes through equilibrium.
(f) Find the phase constant (= initial phase) of the SHM. (a bit complicated …)
(g) Now use your answers above to write an equation for \( x(t) \) substituting appropriate numbers with units.

2. A solid wooden log is floating in water. It has a height \( H \), a cross sectional area of \( A \), and a density \( \rho_s \). If I push the log down an additional distance \( x \), the net force on the log is \( F = \rho_w g Ax \) where \( \rho_w \) is the water density. (a) Explain how we know that the motion of the log is SHM and (b) find the period in terms of the variables mentioned above and any constants like \( g \).