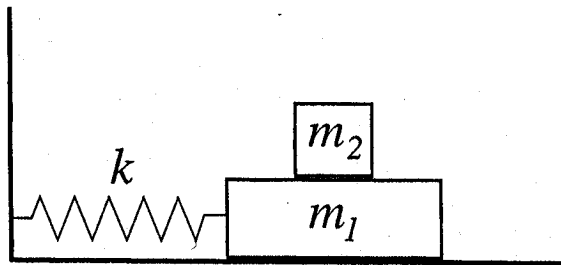


## Problem 5



A large block of mass  $m_1$  executes horizontal simple harmonic motion as it slides across a frictionless surface under the action of a spring with spring constant  $k$ . A block of mass  $m_2$  rests upon  $m_1$ . The coefficient of friction between the two blocks is  $\mu$ . Assume that  $m_2$  does not slip relative to  $m_1$ .

- (a) (3 points) Draw the free body diagrams for  $m_1$  and  $m_2$  at a time when the spring is stretched a distance  $x$  beyond equilibrium to the right.
- (b) (2 points) Write down the horizontal and vertical equations of motion for blocks  $m_1$  and  $m_2$ .
- (c) (2 points) What is the angular frequency of oscillation,  $\omega$ , of the system?
- (d) (3 points) What is the maximum amplitude of oscillation,  $A$ , that the system can have if  $m_2$  is not to slip relative to  $m_1$ ? (Write your answer in terms of  $\omega$ ).