PH 105 LeClair   Summer 2012

# Problem Set 7

Instructions:

1. Answer all questions below. All questions have equal weight.

2. Due Tues 12 June 2012 at the start of lecture.

3. You may collaborate, but everyone must turn in their own work.

1. The potential energy of an Argon dimer may be modeled by

$$U(r) = 4\epsilon \left(\frac{\sigma^{12}}{r^{12}} - \frac{\sigma^6}{r^6} \right)$$

(a) Find the equilibrium separation of the dimer (i.e., the value of r at equilibrium).

(b) Is the equilibrium stable? Justify your answer.

2. Consider the setup below with two springs connected to a mass on a *frictionless* table. Find an expression for the potential energy as a function of the displacement along the x axis, $U(x)$. (Hint: consider the limiting cases $L \to 0$ and $x \to 0$ to check your solution. Also note that $F = -\frac{dU}{dx}$ ...)

Top view
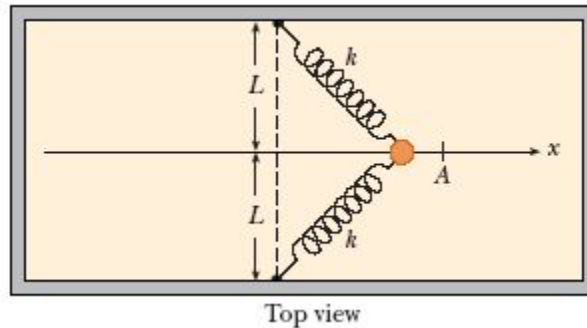
3. A block having a mass of $0.80\,\text{kg}$ is given an initial velocity of $v_A = 1.2\,\text{m/s}$ to the right and collides with a spring of negligible mass and force constant $k = 50\,\text{N/m}$. Assuming the surface to be frictionless, what is the maximum compression of the spring after the collision?