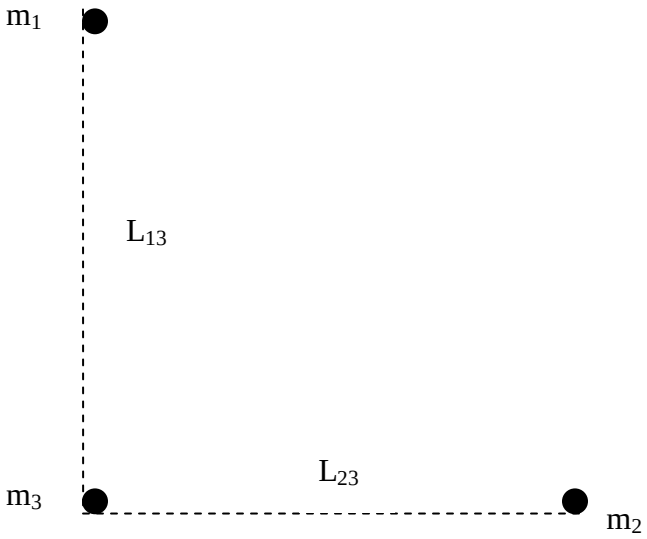
Physics 350 – Undergraduate Classical Mechanics
Numerical Homework IV, due Monday, December 5 at 11:00 a.m.
All solutions must be in hard-copy form;
no electronic copies will be accepted*.*
All solutions must be typed.

Consider three point masses in a triangle configuration which interact gravitationally:



1) Suppose $m_1=m_2=m_3$ and all three masses start at rest. Trace the paths of the ensuing motion on the same plot for all three masses. You can choose the masses to be 1 kg and initially 1 m apart ($L_{13}=L_{23}=1$).

2) Make separate plots of total potential energy and total kinetic energy, and explain the results. Then show that the total energy is conserved during the motion.

3) Show that your numerical method is convergent in time.

4) Repeat (1) (2), and (3) for m_1 = 1 kg, m_2 = 2 kg, and m_3 = 3 kg.

5) *Creative Thinking:* Can you find a set of initial conditions such that two masses end up in a bound orbit while the third flies away hyperbolically? Why or why not?

Hints: Be careful of the 1/r potential energy becoming too large when the masses are near each other, leading to blow-up. You will need a criterion in your code to negate that situation. Also, be cognizant of the time resolution needed when the potential energy is large and/or the kinetic energy is large.

Note: You may not use NDSolve in this problem