

AST 301
Homework #8
Due Friday Nov. 5

1. Go to Phet.colorado.edu.
Choose Play with sims...
Choose Physics, Heat & Thermo (on the left).
Choose Gas Properties.
Choose Run Now!
Pump the handle!
Describe what you see.
Read the pressure. Write down the average of a few measurements.
Read the temperature.
Use the Heat Control to turn up the heat to double the temperature.
How do the atom motions change?
Measure the pressure again. How did it change? Why?
Turn the temperature back down and double the number of atoms in the box. Use light atoms this time.
How do the light atoms' motions differ from the heavy atoms?
How does the pressure change?
Go to Advanced Options and turn off collisions. Does anything change?
Turn collisions back on.
Hold the temperature constant (upper right) and turn on gravity.
How does the distribution of atoms in the box change? Turn off gravity.
Go back to Constant Parameters: None, and slowly slide the wall of the box in. How do things change?
What else can you do with the simulation? How about taking the top off of the box?

2. While you are at phet.colorado.edu:
Choose Physics, Motion, and run My Solar System.
Choose parameters appropriate for a binary star system. These will work:
body1 200 -100 0 0 -50
body 2 100 200 0 0 25
Slide the slider to accurate to slow it down.
Measure the orbital period and the average distance between the two stars (or the sum of the semimajor axes of the two orbits).
Put your numbers for P and a into the formula for M_1+M_2 .
The answer won't come out to 300 because our units aren't years and AU.
Double the masses and run it again. Measure P and a now, and calculate M_1+M_2 .
Did M_1+M_2 come out twice as big?
Try some other set of parameters to see if Kepler's 3rd law works to calculate masses.
How could you use the observed orbits to figure out M_1 and M_2 separately?