Homework 5

Total 23 points

Due Friday, October 11, 12:50 pm in class.
Reading: Chapter 4 from the textbook.
Note: Make your solutions neat, concise, and intelligible. It is not sufficient just to state the answer. Points may be deducted, if it is difficult to find and/or understand the solutions.

Problem 1. A classic harmonic oscillator. Problem 4.28⋆⋆ from the textbook.

Problem 2. Problem 4.36⋆⋆ from the textbook.

Problem 3. The virial theorem. Problem 4.41⋆ from the textbook.

Problem 4. Elastic collision of two particles with unequal masses. Problem 4.46⋆ from the textbook.

Problem 5. Inelastic collision of two particles with unequal masses. Problem 4.48⋆⋆ from the textbook.

Problem 6. Binding Energy ⋆⋆⋆. An alien starship is a sphere of radius R and mass M. To explore very distant galaxies, the starship launches many space bots. The shape of the starship remains to be spherical, the total mass of the bots is M/2. Assume that the bots are very small, arrive to their destination with zero velocity, there is no dissipation of energy in the system, and the total mass of the bots and the starship does not change. Calculate how much energy is required for this exploration mission?