8.08 Problem Set # 6
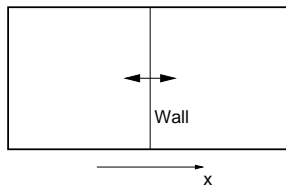
Problems:

1. A chamber of volume $L \times L \times 2L$ is divided by a wall into two chambers, each with a volume $L \times L \times L$. The wall can move freely in the horizontal direction. Assume the two chambers is filled with ideal gas. The number of the particles in each chamber is N. Also the chambers are in contact with a heat bath which keep the temperature of the chambers at a constant T. Find the fluctuation of the position of the wall: $\Delta x = \sqrt{\langle (x - \bar{x})^2 \rangle}$, where $\bar{x} = \langle x \rangle$ is the average position of the wall. Does your result depend on the mass of wall?

2. Problem 10.3 in K. Huang's book.

3. Problem 10.5 in K. Huang's book.

4. Problem 10.6 in K. Huang's book.
   (c) Also find out by what factor does the total number of photon in the universe increases (or decreases) after the expansion.