

Question: We have derived in class, the Boltzmann transport equation for a gas with a single type of molecule. Now consider a gas made up of two types of molecules, A and B . The molecules will have different masses, and the scattering cross sections will be different for $A - A$, $A - B$, and $B - B$ collisions. Assume that the distributions of the A and the B molecules will be independent so that the distribution function itself can be written in the form

$$f(\vec{r}_A, \vec{r}_B, \vec{v}_A, \vec{v}_B, t) = f_A(\vec{r}_A, \vec{v}_A, t) f_B(\vec{r}_B, \vec{v}_B, t).$$

- (a) Construct the transport equations corresponding to f_A and f_B separately (complete with the collision terms).
- (b) Introduce a modified H -function for this system such that it is a decreasing function of time.
- (c) Find the form of the equilibrium distribution.