# Class problems #7

1. Find relativistic and non-relativistic limits for equilibrium number density $(n)$, energy density $(\rho)$ and pressure $(p)$ as a function of temperature for fermions and bosons.

2. Derive an exact expression for the number of relativistic degrees of freedom and reproduce (discuss) qualitatively fig. 1 from the lecture notes #5, in particular show that for $T \gg 100$ MeV $g_\star = 106\frac{3}{4}$, for $T \ll 1$ MeV $g_\star = 3.36$, while for 100 MeV $\gtrsim T \gtrsim 1$ MeV $g_\star \simeq 10\frac{3}{4}$. Verify tables 1 and 2 from the lecture notes.

3. Derive
$$p_i(T) = g_i \int \frac{|\vec{p}|^2}{3E_i(\vec{p})} f_i(\vec{p}, T) \frac{d^3 p}{(2\pi)^3},$$
which is eq.(4) of the lecture notes.