HW#1 Due 2023/10/04

1. Show that the solution $\Phi(r)$ of the following ODE

$$\nabla^2\Phi(r) - \frac{\Phi(r)}{\lambda_{De}^2} = -\frac{1}{\epsilon_0} Q\delta(r)$$

is

$$\Phi(r) = \frac{Q}{4\pi\epsilon_0 r}\exp(-\frac{r}{\lambda_{De}})$$

2. Calculate the Debye length and plasma parameter for
   (a) ionosphere with $T_e=10^3$ K and $n=10^{12}$ m^{-3}
   (b) solar wind with $T_e=10^5$ K and $n=10^7$ m^{-3}.

3. Derive $\Lambda_D >> 1$ from the condition of $e\Phi << K_B T$, where Λ_D is the plasma parameter.