HW 1 (3 points):

Consider an electron storage ring at an energy of 1 GeV, a circulating current of 200 mA and a bending radius of $\rho = 2.22$ meters. Calculate the energy loss per turn, the critical photon energy, and the total synchrotron radiation power.

HW 2 (2 points): Make a short argument about why the trajectory of a charged particle can not intersect with light cone more than once (see slide #8 from the lecture 17)

HW 3 (5 points):

As shown in slide #15, the angular distribution of radiation power is given by

$$
\frac{dP(t_r)}{d\Omega} = \frac{1}{4\pi e_0} \frac{e^2}{4\pi c} \frac{\beta^2}{(1 - \beta \cos \theta)^3} \left[ 1 - \frac{\sin^2 \theta \cos^2 \phi}{\gamma^2 (1 - \beta \cos \theta)^2} \right]
$$

Show that for $\gamma^{-d} << \theta << 1$ and $\gamma >> 1$, the angular spread of the radiation power is in the order of $\gamma^{-1}$. 