Accelerator Physics Homework #7

1. S&E 8.8 (Hint: In the lab frame, you need only to calculate the effects of the fields produced by one bunch on the particles in the other bunch and plug them into the equations).
2. As we discussed in class, charge exchange is often used to inject ions into proton accelerators over several revolutions. On disadvantage is that the stripped beam will continue to pass through the stripping foil, which could increase the emittance through multiple scattering. The Fermilab Booster injects a 400 MeV H- over up to 12 revolutions, using a 200 m Carbon stripping foil. Estimate the increase in normalized emittance of the first beam injected (ie, the beam that ends up going through the foil 12 times) and compare to the nominal injected (RMS) emittance of 2-mm-mr.