1. A particle of charge $q$ is in uniform circular motion with radius $a$ and angular velocity $\omega$. Find the electric and magnetic fields along the axis of the circle as a function of time and of the distance $z$ from the center of the circle. Find an approximate expression valid for large $z$. Pay attention to terms you drop, and state explicitly compared to what other lengths in the problem $z$ must be large in order for your expression to be valid.

2. Following the discussion in class, study the conservation of angular momentum. Starting from the change in the angular momentum of charged particles interacting with the fields, show that the angular momentum density for electromagnetic fields (in vacuum) is

$$ l = x \times g , $$

with $g$ the momentum density found in class. Show that the current describing the flux of angular momentum may be written as

$$ M_{ij} = \epsilon_{jkl} T_{ik}x_l , $$

where $T_{ij}$ is the Maxwell stress tensor found in class.

3. (Jackson 6.24)