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Problems set # 10 **Physics 541-735** November 15, 2011

1. Verify the reference differential cross section for a structureless target given in (4.1.4).

2. Show that if the lectron beam is replaced by a beam of "point" spinless particles, the only change is that the factor (D.0.15) is replaced by $4E^2$. This raises a question: why does the electron spin make no difference in the non-relativistic limit, $v \to 0$?

3. If the charge distribution $\rho(r)$ has an exponential form, e^{-mr}, show, using (4.1.3), that the form factor

$$F(|\vec{q}|) \propto \left(1 - \frac{q^2}{m^2}\right)^{-2}$$

with $q^2 = -|\vec{q}|^2$.

4. Show that the allowed kinematic region for $ep \to eX$ is $0 \leq x \leq 1$ and $0 \leq y \leq 1$. Sketch this physical region in the ν, q^2 plane.