QUANTUM FIELD THEORY 1

Problem sheet 6

1. Calculate the following traces:

$$\mathrm{Tr}\{\not{p}\gamma^{\mu}\not{k}\gamma^{\nu}\not{q}\gamma_{\nu}\not{k}\gamma_{\mu}\}$$

$$\mathrm{Tr}\{\not{p}\gamma^{\mu}\not{k}\gamma^{\nu}\not{q}\gamma_{\mu}\not{l}\gamma_{\nu}\}$$

2. Calculate the differential cross-section with respect to t, $\frac{d\sigma}{dt}$, *and* with respect to centre-of-mass scattering angle θ, $\frac{d\sigma}{d\cos\theta}$, for the (Moeller scattering) process

$$e^- + e^- \rightarrow e^- + e^-.$$

You may assume that all the energies are sufficiently large that the electron mass may be neglected. Express you answer for $\frac{d\sigma}{dt}$ in terms of s and t and for $\frac{d\sigma}{d\cos\theta}$ in terms of s and θ.