PHY 422/622 : ASSIGNMENT III (DUE MAR. 22, 2017)

(1) There is a notion of a *Charge Conjugation* operator that takes particles to anti-particles. Define the action of such an operator on the Dirac spinor as

$$\psi^C \;=\; i\gamma^2\psi^*$$

What is its action on the eigen-spinors $u^{(1)}$ and $u^{(2)}$. Identify any relationships that you observe.

(2) Derive the amplitudes for e^+e^- pair production.

(3) Evaluate in detail and simplify

$$\mathrm{tr}\left[(\not{k}+M)(\not{p}+m)(\not{k}+M)(\not{p}+m)\right]$$

assuming $p^2 = m^2$ and $k^2 = M^2$.