Week 4 (due Jan. 31)

In these problems it is better to use the FeynCalc.m package for Mathematica than to do gamma-matrix traces by hand. See http://www.feyncalc.org/ for detailed info on this package.

1. (20pts) Consider the version of the Yukawa theory with an interaction $L = ig\bar{\psi}\gamma_5\psi$ and the process $e^+e^- \to e^+e^-$. The factor i is there to ensure hermiticity. The amplitude at tree level was written down in class (except I forgot about that pesky i). Let the incoming momenta be p_1, p_2 and the outgoing momenta be p_3, p_4. Compute the absolute-value squared of the amplitude and sum over final polarizations and average over initial polarizations. Express the result in terms of Mandelstam's variables s, t, u.

3. (10pts) Problem 48.2. (In this problem you are supposed to average over the polarizations of the initial particles).

3. (30pts) Problem 48.4.