

## Ph 205c Final Problem Set

(Due: May 25, 2007)

1. Calculate at order  $g^2$  the field renormalizations  $Z_A$ ,  $Z_\psi$  for gluons and quarks in QCD. Also calculate the coupling constant renormalization  $Z_g$ . Do not use background field gauge to relate  $Z_g$  to  $Z_A$ , rather calculate the vertex diagram like you did in QED. Assume there are  $n$ -types of quarks.
2. Using the results from problem 1 calculate the one-loop beta function  $\beta(g)$  for the QCD coupling.