

# Problem Set 1

Physics 445

Due April 19

Some abbreviations: P&S - Peskin & Schroeder

1. We derived the form of an infinitesimal  $SU(2)$  gauge transformation acting on  $A_\mu$ . Derive the action of a finite  $SU(2)$  gauge transformation on the gauge field, and generalize this action to an arbitrary group  $G$ .
2. Although it involves some grungy algebra, it's good for the spirit. Do problem P&S 15.1.
3. More practice with Casimir invariants. P&S 15.5.
4. The expectation value of a Wilson loop will be one of the ways we characterize different phases of non-abelian gauge theory. To get familiar with the concept of a Wilson loop, solve P&S 15.3.