Physics 331 – Problem Set # 6

(due Wednesday, March 8)

1. Peskin and Schroeder, Problem 20.1.

2. Peskin and Schroeder, Problem 20.2.

3. Download and unpack the file `partons.tar` from the course Web page. Information on how to do this is given in the information sheet on the programs which you will also find on the course Web site. Compile and run the program `plotxf`. This will produce a plot of the evolution of the up quark parton distribution in the proton, similar to Peskin and Schroeder, Fig. 17.21, and also a plot of the evolution of the gluon distribution in the proton. (The up quark plot differs in detail from Fig. 17.21 because a different fit to the deep inelastic scattering data was used.) Modify this program to make similar plots for the down quark, anti-down quark, and bottom quark distributions.

4. Compile and run the program `ppcollider` contained in the `partons.tar` distribution. This will produce a plot of the p_T distribution of 2-jet events produced by gg scatting in $p\overline{p}$ collisions at 1.8 TeV in the center of mass, and also a plot of the distribution of 2-jet invariant mass in these events. The latter plot will be similar to the curve gg in Peskin and Schroeder, Fig. 17.13. Modify this program to produce the similar curves for quark-gluon and quark-quark scattering. (Here 'quark' refers to both quark and antiquark.)