Homework Exercises for
QCD and Collider Physics IV
Lecturer: H. Jung

summer term 2007

Exercises for Lecture 1 (30.May 2007)

- show that dLips is Lorentz is identical for the 3 different expression given in the lecture.

- calculate the matrix element squared for the processes:
  $q\bar{q} \to \gamma^*$
  $q\bar{q} \to Z_0$
  $q\bar{q}' \to W^{\pm}$
  and verify the cross sections for these processes as given in the lecture

- calculat e the Matrix element for
  $q\bar{q} \to \gamma^* g$ and
  $q\bar{q}' \to W^{\pm} g$
  Bring it into a form, where the DGLAP splitting function becomes visible.

- calculate numerically $\frac{d\sigma}{d\eta}$ for the process $q\bar{q} \to Z_0 g$ using the matrix elements from above (with γ^* instead of Z_0). Hint: use a simple Hit and Miss method with random numbers.

- calculate explicitly the expressions for M_T as given in the lecture.