

Fourth day:

1. Check that the rapidity transforms linearly under a longitudinal boost.
2. Give examples of boost-invariant and not boost-invariant quantities.
3. Show that

$$\frac{d^3p}{(2E)(2\pi)^3} = \frac{d^2p_T dy}{(2)(2\pi)^3}. \quad (31)$$

4. Show that the matrix element for $q\bar{q} \rightarrow q'\bar{q}'$ is

$$\frac{1}{2\hat{s}} \frac{4\hat{t}^2 + \hat{u}^2}{\hat{s}^2} \quad (32)$$

Use the above expression to derive the matrix element for $qq' \rightarrow qq'$ without doing any further calculation.

5. For di-jet production at leading order, give an expression for the invariant mass of the di-jet system in terms of rapidity and transverse momentum in the partonic centre-of-mass frame.
6. Which one(s) are true? If α_S at 2-loops is used instead of the α_S at 1-loop in a leading order calculation, the result
 - is wrong.
 - does not change.
 - changes but it is not improved.
 - is improved.
7. How are the unknown higher order corrections usually estimated in QCD? Why?