QCD, Colliders & Jets – HW III

1. Demonstrate that both the cone algorithm (without seeds) and the k_T algorithm are IRS at NLO in pQCD, *i.e.*, show that the "found" jet will have the same properties whether it contains a single parton or a pair of collinear partons with the same total momentum. Also show that the jet is unchanged by the emission of a (vanishingly) soft gluon. This does not require a slick argument. The idea is just to give you the opportunity to think through what it takes to be IRS.

2. Use the Snowmass definition of the iterative cone algorithm (i.e., E_T weighting instead of 4-vector addition) to show that the 2-parton phase space splits up as indicated in the figure in the Lecture. While this is really a 2-D problem in (y, ϕ), the fact that there are only 2 partons, which effectively lie in a plane, means we can think of it as a 1-D problem, *i.e.*, just the separation d in that plane.