ASTR 680 Practice questions for lecture 2: Photons

1. A number of active galactic nuclei display jets, that is, long, nearly linear, structures that can extend for hundreds of kiloparsecs. Many display two oppositely-directed jets, but some have only one. If such sources actually all do have two equal and opposite jets, why would we see only one in some cases?

2. Gamma-ray bursts are relatively short (milliseconds to hundreds of seconds) bursts of gamma rays that are known to come from cosmological distances. Some people believe that there are gamma-ray bursts from very high redshift, in the range of 10 to 20. For such sources, the proper distance (i.e., the distance you would measure to them with a ruler) is essentially independent of redshift. Suppose all gamma-ray bursts are intrinsically identical. Also suppose that you observe a gamma-ray burst bolometrically (over all frequencies) for its entire duration as perceived by you. The fluence is the total energy you receive per area, that is, erg cm^{-2}, after you've integrated over the entire burst. How does the fluence depend on redshift?