

Introduction to Astronomy

Exercises week 13

17 January 2020

1. NGC 772 is a barred spiral galaxy that is similar to Andromeda (M31). The angular diameter and apparent magnitudes of NGC 772 are $7'$ and 12.0 respectively, while for Andromeda they are 3° and 5.0. Estimate the distance ratio for these two galaxies, assuming a) they have equal physical size; b) they have equal luminosity.
2. Quasar 3C279 shows increases in brightness that last for about a week. If we assume these “bursts” are caused by a single, short-lived event, then the time-scale of the brightness variation is a measure of the light-travel time across the region where the burst originated.
 - (a) Use this assumption to estimate the size of the disturbed region (measured in AU). Note this is clearly more an upper limit than an actual physical size!
 - (b) During the outburst, the apparent magnitude of this quasar is 18. Assuming the distance is 2000 Mpc, calculate the absolute magnitude.
 - (c) If the measured magnitude was the magnitude in the V-band, calculate what the total luminosity of the quasar is during the outburst (expressed in Solar luminosities). Then use this value to compute the average luminosity produced per cubic AU.