

Stars & Galaxies, Galaxies example class 1

Question 1. Short questions.

1. What are the three main galaxy types? Describe three differences.
2. Derive the equation that relates the apparent magnitude, m , the absolute magnitude, M , and the distance to a star, r . Neglect obscuration.
3. Describe the three main stellar components of a spiral galaxy.

Question 2.: Long question: Counting stars

1. A stellar system has uniform density of stars, n , with identical luminosity, L . Show that the number stars, N , brighter than some limiting magnitude, m , is $\log(N) = c + 0.6 m$, where c is a constant. Sketch this relation
2. Apply your reasoning to the combined counts of two sets of stars with different luminosities, L_1 and L_2 . Show that the slope of the $\log(N) - m$ relation does not change. What does change?
3. Assume you are at the centre of a spherical stellar system, which has an edge at 1kpc i.e. there are no stars further away than 1kpc. Compute and sketch $N(m)$, assuming the absolute magnitude of the stars is $M = 5.5$ (as it is for the Sun), and the limiting magnitude $m = 18$.
4. In the case of obscuration, the distance modulus equation changes to $m - M = 5 \log(d) - 5 + A d$. Find the correction to $\log(N < m)$ when the amount of obscuration is small. Sketch $\log(N < m)$ in this case.