Introduction to Astronomy

HW100329

due April 07, 2010

1. In the direction of a particular star cluster, interstellar extinction allows only 15% of a star's light to pass through each kiloparsec (1000 pc) of the interstellar medium. If the star cluster is 3.0 kpc away, what percentage of its photons survives the trip to the Earth?

2. A comparison of the Crab Nebula taken in 1973 and in 2001 can be found with this url, http://apod.nasa.gov/apod/ap011227.html   With reference to some "fixed" stars, we can determine the expanding angular speed of the nebula, about 0.15 arcsec/year. Radio observations of the spectral lines indicate a line-of-sight speed of 1500 km/s. Show how these two parameters would allow us to estimate the distance to the Nebula. What assumptions are made in your calculation? How does your answer differ from what is given in the textbook?

3. The star δ Cephei is a Type I Cepheid variable. Its apparent brightness varies with a period of 5.4 days, with an average brightness of 5.1 x 10^{-13} that of the Sun. Approximately how far away is δ Cephei?

4. The earliest fossil records indicate that life appeared on the Earth about a billion years after the formation of the solar system. Assuming the same evolutionary processes for life, what is the most massive star that has a long enough main-sequence lifetime to permit life to form on one or more of its planets?