Astronomy UN2002 Spring 2020
Due Wed. Jan. 29 Prof. J. Halpern

Homework #1

1. A star is identified as type G2 V based on the absorption lines in its optical spectrum. It also has apparent magnitudes $V = 16.00$ and $B = 17.05$.

   (a) What is the color excess $E(B - V)$, also called selective extinction, to this star?

   (b) What is the total extinction A_V to this star? Assume that the ratio of R of total to selective extinction is 3.1.

   (c) What is the distance to this star?

   (d) What distance would you have computed if you knew the spectral type and the V magnitude only, and ignored extinction?

2. The typical interstellar medium (ISM) has on average 1 hydrogen atom and 0.1 helium atom per cubic centimeter, which account for 99% of the mass of the ISM. In addition there are dust grains that account for 1% of the mass of the ISM. Assume that the typical grain is a sphere of radius $0.1\,\mu$m, which has a density twice that of water.

   (a) Compute the mass density of the gas-phase ISM (hydrogen plus helium).

   (b) Compute the mass of one grain.

   (c) How many grains are there per cubic kilometer?

   (d) What is the average distance between dust grains?