

ASTR368

HW1

January 19, 2024

Due January 26, 2024

1) (2 pt each part) You are observing a cloud that is 20 pc thick and 700 pc from the Earth (at the nearest point). This cloud has $A_V = 1.1$ mag. In the direction of the nebula is a B-type star with absolute visual magnitude $M_V = -1.1$. Ignore any other sources of extinction.

a) What is the apparent visual magnitude of the star if it is in front of the cloud?

b) What is the apparent visual magnitude if it is behind the cloud?

c) If you did not know about the cloud (and therefore did not know about extinction), how far would you assume it is given the apparent visual magnitude from part b)?

d) One approximation for the wavelength dependent nature of extinction is that $A_\lambda \propto 1/\lambda$. Using this approximation, What is A_B ?

e) Using your answer for d), what is the flux ratio F_V/F_B for the star?

2) (4 pt) You observe an HI cloud with a line-center optical depth of 0.5. If you measure the full-width-at-half maximum line width of $\delta V = 10 \text{ km s}^{-1}$, what is the thickness of the cloud? Assume reasonable values for the cloud temperature and density. Express your answer in pc.