Homework 6

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1. (a)

$$206265\text{AU} = 1\text{pc}$$
$$\frac{2.7 * 10^6}{206265} = 13.09\text{pc}$$

(b)

$$d = \frac{1}{p''}$$
$$p'' = \frac{1}{d}$$
$$p'' = 7.64 * 10^{-2}\text{arcseconds.}$$

Modern day technology would be able to measure this since modern techniques are as accurate as five significant digits.

2.

$$d = \frac{1}{p''}$$
$$d = \frac{1}{0.135}$$
$$d = 7.41\text{pc}$$

3. (a)

$$T = \frac{4.74 * \lambda}{p''}$$
$$T = \frac{4.74 * 7.67}{0.225}$$
$$T = 161.58\text{km/s}$$

(b)

$$V^2 = V_R^2 + V_T^2$$
$$V^2 = (226)^2 + (161.58)^2$$
$$V^2 = 77184.10$$
$$V = 277.82\text{km/s}$$

(c) Given $V_R = 226$, then

$$\begin{aligned} \frac{v}{c} &= \frac{\Delta\lambda}{\lambda} \\ \frac{226}{300} &= \frac{\Delta\lambda}{\lambda} \\ 0.753 &= \frac{\Delta\lambda}{\lambda}. \end{aligned}$$

Which implies that the star is causing a redshift, and the star is moving away from the sun.

4.

$$\begin{aligned} T &= 4.74 * \lambda * d \\ 62 &= 4.74 * 0.065 * d \\ 201.23\text{pc} &= d \end{aligned}$$

5.

$$\begin{aligned} V^2 &= V_R^2 + V_T^2 \\ V_T^2 &= V^2 - V_R^2 \\ V_T^2 &= (210)^2 - (84)^2 \\ V_T^2 &= 192.47\text{km/s} \end{aligned}$$

6. (a)

$$\begin{aligned} v &= \frac{\Delta\lambda}{\lambda} * c \\ v &= \frac{656.51 - 656.28}{656.28} * 300 \\ v &= 0.11\text{km/s} \end{aligned}$$

(b) Since the star's movement caused redshift, the star is moving away from us.