# Astro540 Homework 1

## Problem 1

- total proper motion $\mu$

$$\mu = \sqrt{\mu_\delta^2 + \cos^2 \delta \mu_\alpha^2}$$

- proper motion velocity component

$$v_\tau = \mu d = 0.376\text{pc} \cdot 1.21''\text{a}^{-1} = 2.16\text{km} \cdot \text{s}^{-1}$$

- total velocity

$$v = \sqrt{v_t au^2 + v_r^2} = \sqrt{7.6^2 + 2.16^2}\text{km} \cdot \text{s}^{-1} = 7.9\text{km} \cdot \text{s}^{-1}$$

- when teh object is closest to sun, the direction of its motion is perpendicular to the line connected it and the sun. Thus the distance is caculated as

$$d_0 = d \cdot \sin\theta = 0.376\text{pc} \cdot \frac{v_\tau^2}{v} = 0.10\text{pc}$$