1. An expression for the proper motion of a star (motion perpendicular to the line of sight) is given by Eq. 1.5 of your book. But the proper motion $\mu$ is in radians per second, not very convenient for astronomers. Show that for a star at distance $d$ (in parsecs) with proper motion $\mu$ (in arcsec per year), the transverse velocity (in km/sec) is:

$$v_t = 4.74 \, \mu \, d$$

You will need the number of arc seconds in a radian, the number of km in an Astronomical Unit, and the number of seconds of time in an Earth year.

2. The star Vega has a trigonometric parallax (observed from the Earth) of 0.130 arc seconds. Its proper motion is 0.350 arc seconds per year.

   a. Find the distance to Vega in (i) parsecs; (ii) light-years; (iii) Astronomical Units; and (iv) kilometers.
   b. What is its distance modulus?
   c. The V-band magnitude of Vega is +0.03. What is it absolute visual magnitude?
   d. What is the transverse velocity of Vega in km/sec?

Carroll and Ostlie, problems 3.8, 3.9, 3.13, and 3.15.