Jan 19 2019. ①

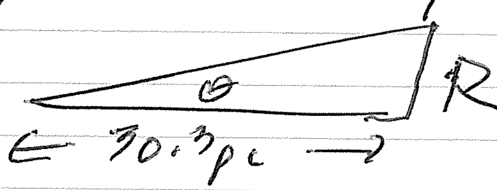
1. $\pi = 0.033'' \Rightarrow D = 30.3\,pc = 1/\pi$

Radial velocity $\frac{\Delta\lambda}{\lambda} = \frac{V}{c} \Rightarrow V = c\,\frac{\Delta\lambda}{\lambda}$

$$V = 3\times10^5\ \frac{km}{s} \times \frac{.03010}{440.47501}$$

$\underline{V = 20.5\ Km/SE}$ (radial V)

Tangential velocity



In 1 year
$\theta = .020''$

$$\theta = \frac{R}{30.3\,pc.}$$

Need θ in radians

$$\theta = \frac{.02}{206265} = 9.696\times10^{-8}\ \text{radians}$$

$\therefore R = 30.3 \times 9.696\times10^{-8}\ pc$

$= 2.938\times10^{-6}\ pc.$

Star moves this distance in 1 year

$1\ pc = 3.1\times10^{13}\ Km.$

$\therefore R = 9.11\times10^{7}\ KM$

Star covers this distance in 1 year $= 3\times10^7$ sec

$\therefore$ Tangential vel $\underline{3.04\ Km/s.}$

Total Velocity $= \sqrt{(20.5)^2 + (3.04)^2}$

$= 20.7\ Km/SEC$

2

2-

(a) Abs. mag Sun $m - M = 5 \log \frac{r}{10}$ (1) (r in pc)

$r = 1$ AU, 206265 AU/pc

$\therefore$ 1 AU $= 4.848 \times 10^{-6}$ pc.

Put this into (1)

$$-26.7 - M_{\odot} = 5 \log \frac{4.846 \times 10^{-6}}{10}$$

Solving gives $\underline{M_{\odot} = +4.87}$

(b) We will need absolute magnitude Proxima for this.
Distance to Proxima $= 1/\pi$ (pc).
$= 1/0.77 = 1.3$ pc.

$m - M = 5 \log \frac{r}{10} \Rightarrow M_{proxima} =$

$\underline{M_p = m - 5 \log \frac{r}{10}} = \cancel{15.6}$ 15.48

Brightness + Magnitudes

1 = Proxima
2 = Sun

$$m_2 - m_1 = 2.5 \log F_1/F_2$$

$$\frac{4.87 - 15.48}{2.5} = \log \frac{F_{prox}}{F_{sun}}$$

$$\therefore \frac{F_{prox}}{F_{sun}} = \frac{1}{17{,}530}$$

3. Can't add magnitudes so need to convert to fluxes add fluxes and then convert back to magnitudes

Let mag = 1 star have 100 Units of flux (this is arbitrary)

$\therefore$ mag 2 star has.

$$m_2 - m_1 = 2.5 \log \frac{L_1}{L_2}$$

$$1 = 2.5 \log \frac{L_1}{L_2}$$

$$\Rightarrow L_2 = 40 \text{ Units flux}$$

and

mag 3 star has

$$m_3 - m_1 = 2.5 \log \frac{L_1}{L_3}$$

$$2 = 2.5 \log \frac{L_1}{L_3}$$

$$\Rightarrow L_3 = 16$$

$\therefore$ Total 2 + 3 is 56 Units leave 44 Units for other component

$$m_{other} - m_1 = 2.5 \log \frac{100}{56}$$

$$\Rightarrow m_{other} = \underline{1.63}$$

4. Sun emits 3.86×10^{26} watts

Sun radiates into 4π steradians

$\therefore$ Sun emits $\dfrac{3.86 \times 10^{26}}{4\pi}$ $\dfrac{W}{SR}$

This does not vary with distance as it is the same number (r does not enter).