HW 2, #2

Distance to the Pleiades has been measured by parallax

$$d = 136 \text{ pc}$$

Using provided Gaia photometry, we can make a color-mag diagram (see "mystery-a.png"). At $(BP-RP) = +1.0$, the main sequence has

$$m_G = 11.2$$

Plotting data from the mystery cluster on the same diagram (see "mystery-b.png") shows that at this same color, the mystery's main-sequence has apparent mag

$$m_G(\text{mystery}) = +15.4$$

Thus, the offset is

$$\Delta m = 15.4 - 11.2 = 4.2 \text{ mag}$$

So $$(m-M)_{\text{mystery}} = (m-M)_{\text{pleiades}} + 4.2$$

But $$(m-M)_{\text{pleiades}} = 5\log(136\,\text{pc}) - 5 = 5.67$$

$$\rightarrow (m-M)_{\text{mystery}} = 5.67 + 4.2 = 9.87$$

$$\rightarrow d_{\text{mystery}} = 10^{0.2 * [(m-M)+5]}$$

$$= 941 \text{ pc}$$

p2 HW 2, #2

Complications: both clusters are reddened by dust in space.

Using

$$A_G = 1.86\,(BP - RP)$$

we can compute

cluster	$E(BP-RP)$	A_G
Pleiades	+0.08	+0.15
mystery	+0.42	+0.78

See corrected color-magnitude diagram "mystery_c.png".

In this diagram, the vertical offset between the clusters is

$$\Delta m = +5.1 \text{ mag}$$

So distance to mystery cluster is

$$d_{mystery} = 10^{0.2\left[(5.67 + 5.1) + 5\right]}$$

$$= 1430 \text{ pc}$$