HW 2, #3

Given Gaia measurements of a set of stars in the Praesepe cluster, we can use the average parallax to estimate distance:

$$\text{avg parallax} = 5.40 \text{ mas}$$

$$\rightarrow \text{dist} = \frac{1}{0.00540} = 185 \text{ pc}$$

$$(m-M) = 5\log(185) - 5 = 6.34 \text{ mag}$$

We can make a color-magnitude diagram - see "praesepe-a.png"
The main sequence turnoff occurs at

$$M_G = +8.0$$
$$(BP-RP) = +0.25$$

The brightest white dwarfs have

$$m_G = +17.7$$

Thus, their absolute magnitude must be

$$(m_G - M_G) = 6.34 \text{ mag} \rightarrow M_G = m_G - 6.34$$
$$= +11.4$$

Their luminosity compared to the Sun is

$$\frac{L_{WD}}{L_\odot} = 10^{-0.4[M_{WD} - M_\odot]} = 10^{-0.4[11.4 - 4.67]}$$

$$= 0.0020$$