HW 3, #2

Consider the open cluster NGC 5662. Does main-sequence fitting yield the same distance as a Cepheid which may be a member?

Look at color-magnitude diagram based on Gaia data, * "ngc5662_a.png." The main-sequence turnoff appears at

$$(BP - RP) \simeq 0.0 \text{ mag}$$

* corrected for extinction

Models of these stars can be compared to the measurements — see "ngc5662_b.png." The offset yield a distance modulus

$$(m - M) \simeq 8.5 \text{ mag}$$

The Cepheid star close to the cluster has a period of

$$P \simeq 5.5 \text{ days}$$

(see light curves "ceph_unphased.png" and "ceph_phased.png.") This implies an absolute mag

$$M_V = -2.678 \log P - 1.0 = -2.98$$

The average apparent mag, correcting for $A_V = 1.24$ mag, is

$$m_V = 6.8 - 1.24 = 5.6$$

Thus the distance modulus to the Cepheid is

$$(m - M) = 5.6 - (-2.98) = 8.5$$

Aha! This is approximately the same as the distance modulus to the cluster ... so it might be a member.