## Distance Luminosity Exercises Solutions



Ex.3:

Determine the Apparent Magnitude of the red dwarf Proxima Centauri from a distance of 1AU.
In other words, how bright would it be if we replaced the Sun with Proxima Centauri?
Absolute Magnitude (M) Proxima Centauri: **+ 15.53**

| | |
|---|---|
| Formula: $\mathbf{m - M = 5\ log\ d - 5}$ change to: $\mathbf{m = 5\ log\ d - 5 + M}$ | d = 1 AU (change to pc)<br>1 pc ~ 2.06 x $10^5$ AU<br>1 AU = $\frac{1}{2.06\ x\ 10^5}$ = 4.854 x $10^{-6}$ pc<br>**1 AU ~ .000005 pc** |

$$m = 5\ log\ d - 5 + M$$

$$m = 5\ log\ .000005 - 5 + 15.53$$

$$m = 5\ log\ .000005 - 5 + 15.53$$

$$m = 5\ (-5.301) - 5 + 15.53$$

$$m = -26.505 - 5 + 15.53$$

= **-15.975**

- So that's a fair bit brighter than the full moon (m = - 13), but nowhere near as bright as the Sun (m = -27)

Ex. 4:

Astronomers discover a Type IA supernova in a galaxy cluster with an Apparent Magnitude of + 15.819. Determine the distance to the Galaxy cluster. **Express your final answer in Light Years.**

**Working Formula:**

$$d = 10^{(m - M + 5)/5}$$ ("d" is in parsecs)

**Data:**

m = +15.819 (given)

M = -19 (absolute magnitude of a Type Ia Supernova)

$$d = 10^{(15.819 - (-19) + 5)/5}$$

$$d = 10^{(39.819)/5}$$

$$d = 10^{7.9638}$$

$$= 92{,}002{,}578.66 \text{ pc}$$

X 3.26

( 1 pc = 3.26 LY)

$$= 299{,}928{,}406.4 \text{ LY}$$