Not A, but B

a.) $M_{V,A} = 1.4$

$M_{V,B} = 11.4$ (100x is 5 mags, or calculation via Eq. 3) 1 pt

$m - M = 5 \log \left(\frac{d}{10 pc} \right)$ 0.5 pt

$d = 2.6$ pc

$\Rightarrow$

$m - M = -2.9$ 0.5 pt

$\Rightarrow m_{V,B} = 8.5$ 1 pt

c $d = \left(\frac{1}{p''} \right)$ 0.5 pt

$p'' = \frac{1}{2.6} = 0.38$ arcsec

$= 1.1 \cdot 10^{-4}$ degree

0.5 pt

Two galaxy clusters

$2\langle KE\rangle + \langle PE\rangle = 0$ (0.5 pt)

virial theorem

$$PE = -\frac{GMm}{R}$$ (0.5 pt)

$$KE = \frac{3m\sigma_R^2}{2}$$ (0.5 pt)

$\Downarrow$

if V is used instead of $3\sigma_R^2$ these 0.5 pt are not given but rest can be correct

$$M = \frac{3\sigma_R^2 R}{G}$$ (0.5 pt)

R & G are the same (0.5 pt)

$\sigma_{R\,Coma} = 3\,\sigma_{R\,Fornax}$

$\Rightarrow M_{coma} = 3^2 M_{Fornax}$

$X = 9$ (0.5 pt)

One and one

a.) $F_{tot} = 1.25 \cdot F_{bright}$ (1 pt)

$m_{tot} - m_{bright} = -2.5 \log_{10}(1.25)$ (0.5 pt formula)

$= -0.24$ mag (0.5 pt answer)

b.) $\left(\frac{L}{L_\odot}\right) = \left(\frac{T}{T_\odot}\right)^4 \left(\frac{R}{R_\odot}\right)^2$ (0.5 pt)

$\Rightarrow \left(\frac{L_1}{L_2}\right) = \left(\frac{T_1}{T_2}\right)^4 \left(\frac{R_1}{R_2}\right)^2$

$\Rightarrow \frac{R_1^2}{R_2} = \left(\frac{L_1}{L_2}\right) \cdot \left(\frac{T_2}{T_1}\right)^4$ (0.5 pt)

surface disk = πR^2

$= 0.25 \cdot \left(\frac{1}{0.8}\right)^4$ (0.5 pt)

$= 0,61$

$\Rightarrow 61\%$ (0.5 pt)