Podane so svetlobne krivulje v spektralnih območjih B, V in R za dve supernovi tipa Ia, ki so ju astronomi opazovali v dveh različnih galaksijah. Na abscisi grafov je čas v mesecih/dnevih, na ordinati pa navidezne magnitude v pripadajočih spektralnih območjih. Na fotografijah (v negativu) sta galaksiji, v katerih sta zasvetili supernovi. V preglednici so njune ekvatorialne koordinate.

Izračunaj oddaljenost obeh galaksij, če veš, da je absolutna magnituda supernov Ia v območju V, ko je njihov sij največji, -19.
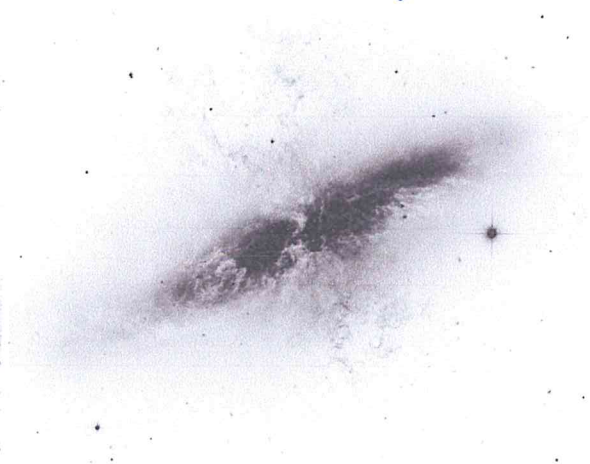
STA ISTI
SPEKTRALNI
KLAS

galaksija	α	δ
1	14^h03^m	$+54°21'$
2	09^h56^m	$+69°41'$

večja ekstinkcija

galaksija 1
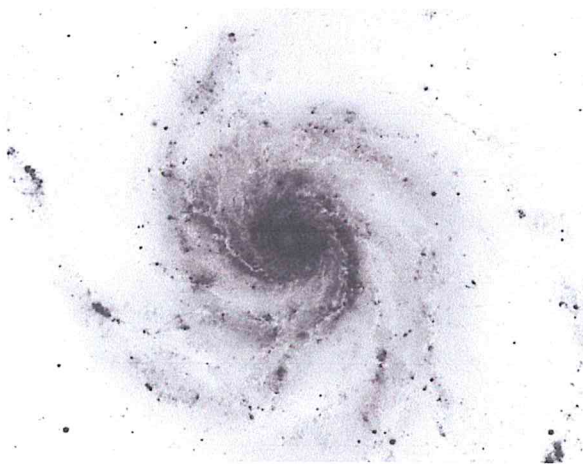
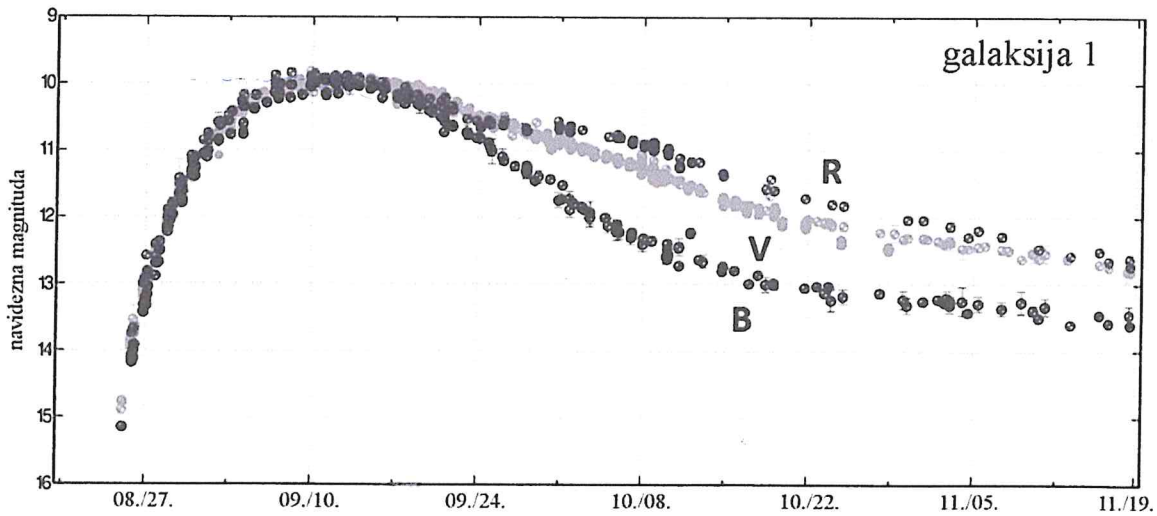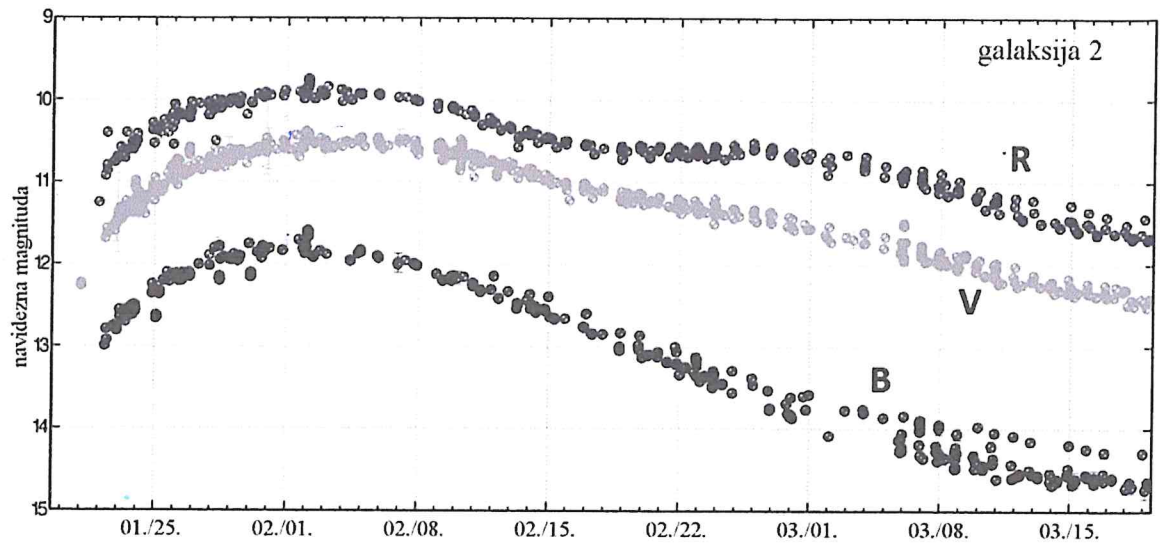galaksija 2

galaksija 1

galaksija 2

GALAXY 1:

$V_{MAX} = +10^m$

$\frac{F_M}{F} = \frac{r^2}{R_M^2} = 10^{-0.4(M-m)} \Rightarrow r = 10^{0.2(m-M)} \cdot R_M = 10^{0.2(10-(-19))} \cdot 10\,pC =$

short path through the dust of galaxy, LITTLE EXTINCTION ~> since galaxyes are very thin discs, We can take it to be $\sim 0^m$.

$\boxed{B_1 - V_1 = M_B - M_V = 0^m}$!!!

$\boxed{10^{6.8}\,Pc}$

GALAXY 2:

light => Long path through the dust of galaxy, A LOT of extinction
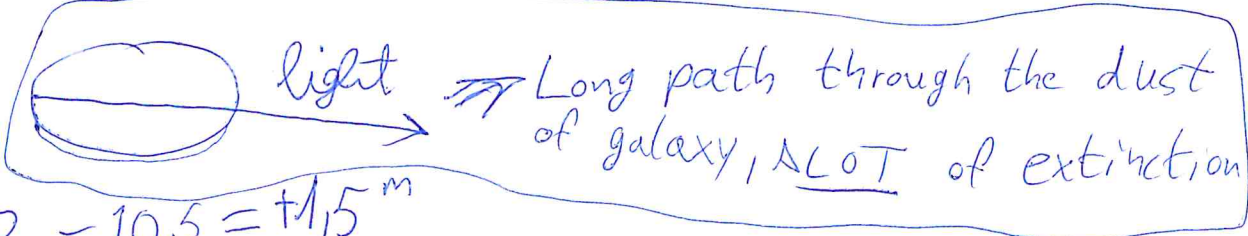
$B_2 - V_2 = 12 - 10.5 = +1.5^m$

$E_{B-V} = (M_B - M_V) + (B-V) = B-V = +1.5^m$

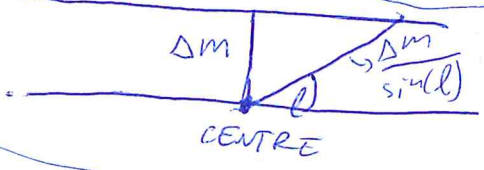0 (shown in Galaxy 1 graph) → because $B_1 - V_1 = M_B - M_V$, since in Galaxy 1 there is no extinction

$\frac{E_V}{E_{B-V}} \sim 3 \Rightarrow E_V = 3\,E_{B-V} = +4.5^m$

$V_{ACTUAL_2} = V_{MAX_2} - 4.5^m = 10.5^m - 4.5^m = 6^m \leftarrow V_{ACTUAL\,2}$

$r_2 = 10^{0.2(V_{ACTUAL_2} - M_V)} \cdot R_M = 10^{0.2(6-(-19))} \cdot 10\,pC = \boxed{10^6\,Pc}$

If we knew galactic latitude l of both galaxyes, we could also estimate extinction due to OUR GALAXY:

OUR GALAXY:

Δm $\frac{\Delta m}{\sin(l)}$ => extinction in our galaxy $\propto \frac{1}{\sin(l)}$; $l \to$ galactic latitude

CENTRE

We could determine l of galaxy 1 and 2 from their equatorial coordinates of galactic centre.

We could estimate aditional extinction due to intergalactic dust, if we knew, how many magnitudes per parsec extinction it causes.

$\Delta E_{EXTRA} = K \cdot r$, where K is extinction constant.