1. Show that the spatial Ricci tensor $\tilde{R}_{ij}$ for the Friedmann-Robertson-Walker metric

$$g_{tt} = 1, \quad g_{ti} = 0, \quad g_{ij} = -R^2(t)\tilde{g}_{ij}(x)$$

is of the following form:

$$\tilde{R}_{ij} = -2k\tilde{g}_{ij},$$

where $k$ is the standard parameter of the FRW metric.

2. Show that $(tt)$, $(ij)$ components of the Einstein equations and the energy-momentum conservation equation $(T^{\mu\nu}_{\mu\nu} = 0)$ for the FRW metric are not independent. Explain why does it happen.