MTH 437/537 **HW #7** Spring 2019

0. **WARMUP** *(Do not turn this problem in, but see me if you need help.)*
Determine the (nonzero) components $R^i{}_{jkl}$ of the curvature 2-forms

$$\Omega^i j = \frac{1}{2} R^i{}_{jkl}\, \sigma^k \wedge \sigma^l$$

for the Robertson-Walker geometry, with line element

$$ds^2 = -dt^2 + a(t)^2 \left( \frac{dr^2}{1-kr^2} + r^2\, d\theta^2 + r^2 \sin^2\theta\, d\phi^2 \right)$$

with $k = -1, 0, 1$ depending on whether the spatial cross-sections are hyperbolic, flat, or spherical, respectively.

1. Using the relationships

$$R_{ij} = R^m{}_{imj}$$
$$G^i{}_j = R^i{}_j - \frac{1}{2}\, \delta^i{}_j\, R$$

compute the (nonzero) components $G^i{}_j$ of the *Einstein tensor* for the Robertson-Walker geometry.