. Compute the nonzero components of the Riemann tensor, the Ricci tensor, and the scalar curvature for

(1) the 2-d sphere: $ds^2 = R^2 d\theta^2 + R^2 \sin^2\theta \, d\varphi^2$ $\quad$ ($R =$ const)

(2) the 4-d Schwarzschild metric:

$$ds^2 = -\left(1 - \frac{2M}{r}\right) dt^2 + \frac{1}{1 - \frac{2M}{r}} dr^2 + r^2 \left(d\theta^2 + \sin^2\theta \, d\varphi^2\right)$$

- Compute $[\nabla_\mu, \nabla_\nu] S^\rho{}_{\lambda\sigma}$ in terms of $S^\mu{}_\nu$ and $R^\rho{}_{\sigma\mu\nu}$ for any (1,3) tensor field
- Go through the proofs in all exercises in the lecture slides !!!

Extra work, for pleasure:

- Work out the details of the proof that

$$\delta V^\mu = - R^\mu{}_{\lambda\rho\nu} V^\lambda T^\rho S^\nu \, \Delta t \cdot \Delta s \, ,$$

where δV^μ is the infinitesimal change of the vector V^μ when it is parallel thansported along the infinitesimal closed curve defined by $T^\rho \Delta t$ and $S^\nu \Delta s$ (see slides on the website for the solution)