HW 5 (40 points) - To be handed by Thursday, Oct 3 in the class or by email

1. (20 points) Prove that in normal coordinates, $R_{ijkl}(P) = \frac{1}{2}\left(g_{ik,jl} + g_{jl,ik} - g_{il,jk} - g_{jk,il}\right)(P)$. Using this fact prove that $R_{ijkl} = \lambda(g_{il}g_{jk} - g_{ik}g_{jl})$ for S^n.

2. (20 points) Prove that if $\tilde{g} = e^{2\phi}g$, then $\tilde{R}_{ijkl} = e^{2\phi}R_{ijkl} - e^{2\phi}(g_{ik}T_{jl} + g_{jl}T_{ik} - g_{il}T_{jk} - g_{jk}T_{il})$ where $T_{ij} = \nabla_i\nabla_j\phi - \nabla_i\phi\nabla_j\phi + \frac{1}{2}|d\phi|^2 g_{ij}$. Using this fact, or by direct calculation, prove that $R_{ijkl} = \lambda(g_{il}g_{jk} - g_{ik}g_{jl})$ for hyperbolic space.