16) Prove that parallel transport preserves length(s), and calculate the angle between a tangentvector at the north-pole N of S^2, and the vector obtained by parallel transport along the meridian M to the equator, then along the equator and finally back to N along a meridian $\tilde{M}$ that at N makes an angle θ with M.

17) Show that for an arc-length parametrized geodesic $\vec{C}(s) = \vec{f}(u(s), v(s))$ on a surface of revolution $\vec{f} = (f(u)\cos v, f(u)\sin v, h(u))$

$$\ddot{u} - \frac{ff'}{f'^2 + h'^2}\dot{v}^2 + \frac{f'f'' + h'h''}{f'^2 + h'^2}\dot{u}^2 = 0$$

follows from the second geodesic equation,

$$\ddot{v} + 2\frac{f'}{f}\dot{u}\dot{v} = 0$$

18) By explicitly calculating the left hand side and comparing with the Gauß consistency equations derived earlier in index notation prove that if X, Y and Z are tangent vectorfields along a hypersurface $S \subset \mathbb{R}^N$,

$$\nabla_X \nabla_Y Z - \nabla_Y \nabla_X Z - \nabla_{[X,Y]} Z = h(Z,Y)LX - h(Z,X)LY.$$