Homework: 120A Due Monday, March 3

Let $S(u,v) = (f(u), g(u)\cos v, g(u)\sin v)$

$-\pi < v < \pi \quad u \in (a,b) \quad a < b$

$f' > 0 \quad g > 0 \quad (f')^2 + (g')^2 = 1$

(This is a "surface of revolution" obtained by rotating an arc length parameter plane curve $(f(u), g(u))$ in the upper half of the (x,y) plane around the x-axis).

1. Compute E, F, G for this surface
2. Compute N (unit normal) for this surface.
3. Compute L_{11}, L_{12}, L_{22}
4. Compute the Gauss curvature
5. Find S_{uu}, S_{uv} and S_{vv}'s tangent parts by subtracting $(S_{uu} - N(S_{uu}))$ their normal parts.
6. Verify that the tangent parts you found in part (5) satisfy $\langle T(S_{uu}), S_u \rangle = \frac{1}{2} E_u$ (and similarly for the other formulas for $\langle T(S_{\cdot\cdot}), S_{\cdot} \rangle$).
7. Do parts 1-6 in the specific case $(a,b) = (-\frac{\pi}{2}, +\frac{\pi}{2})$

   $(f(u), g(u)) = (\sin u, \cos u)$

   (The surface is a unit sphere)