Math 474 HW #9

Due 2:00 PM Friday, Nov. 15

1. (Shifrin Problem 2.2.8)

   (a) Suppose $p \in \Sigma$ is a hyperbolic point. Prove that the principal directions bisect the asymptotic directions at p.

   (b) Prove that if the asymptotic directions of Σ are orthogonal, then Σ is minimal. Prove the converse assuming Σ has no planar points.

2. (Shifrin Problem 2.3.12) Show that the Gaussian curvature of the parametrized surfaces

$$\vec{x}(u, v) = (u \cos v, u \sin v, v)$$
$$\vec{y}(u, v) = (u \cos v, u \sin v, \ln u)$$

   is the same for each (u, v), but that the first fundamental forms $I_{\vec{x}}$ and $I_{\vec{y}}$ do not agree.