1. Prove two of the following three propositions:
   A. In neutral geometry, if the sum of the angles of every triangle is $\pi$, then Euclid’s Postulate 5 holds.
   B. In neutral geometry, suppose $\Delta ABC \cong \Delta DEF$. Then there is a sequence of at most three reflections whose composition carries $A, B, C, \text{onto } D, E, F$ respectively.
   C. If the respective angles of two half-plane triangles are equal then the triangles are congruent (AAA congruence).

2. A Riemann geometry on the interior of the unit disk has metric

   $$\mathcal{M} = (1 - v^2)du^2 + uvdu + (1 - u^2)dv^2.$$ 

   Determine the following relative to $\mathcal{M}$ (definite integrals are acceptable as answers):
   a. The area of the unit square $0 \leq u, v \leq 1$.
   b. The angle between the curve parametrized by $u = t^2 + t, v = 2 - 3t$ and the curve parametrized by $u = 4 - 2t, v = 3 + t$, at the point $(0, 5)$
   c. The length of the curve parametrized by $u = t, v = 2t, 0 \leq t \leq 1$.

3. Determine the half-plane distance between the points $(0, 8)$ and $(8, 8)$. Also compute the measure of the hyperbolic angle formed by the $y$-axis with the geodesic joining these two points.

4. Draw the flow diagrams of the following hyperbolic isometries:
   a. $3z + 2$
   b. $\frac{-1}{z}$
   c. $\frac{2z-5}{z+6}$.

5. Prove that there is no conformal Riemann geometry that is isometric to the half-plane metric $\mathcal{H}$ and whose geodesics are the restrictions of Euclidean straight lines.

6. Prove that the transformation $(\tilde{u}, \tilde{v}) = f(u, v) = (-\ln v, u)$ is an isometry from the upper half-plane $\mathcal{H}$ to the metric $\mathcal{M} = du^2 + e^{2u}dv^2$.

7. Prove that the diameters of the unit disk are geodesics of the Poincaré metric

   $$\frac{4(du^2 + dv^2)}{(1 - u^2 - v^2)^2}.$$ 