

Comprehension questions

PROBLEM 36.1. Find an explicit hyperbolic transformation which takes the geodesic $\{x = 0, y > 0\}$ to $\{x^2 + y^2 = 1, y > 0\}$.

PROBLEM 36.2. If a hyperbolic transformation exchanges the two points $(0, 1/2)$ and $(0, 1)$, what does it do to the point $(0, 2)$, and why?

PROBLEM 36.3. Take two points z, w in the hyperbolic plane, so that $\text{dist}(z, w) = r > 0$. Show that there is a hyperbolic transformation which takes z to i , and takes w to $e^r i$.

PROBLEM 36.4. Let c be a geodesic, and p a point not lying on the geodesic. Show that there is a unique geodesic through p which intersects c orthogonally.

PROBLEM 36.5. Take a geodesic, and a hyperbolic circle centered at a point of that geodesic. Show that the two intersect each other orthogonally. (You did a special case of this in Problem 34.3, but don't use that here; we have much more elegant methods at our disposal now.)

PROBLEM 36.6. Check by a direct computation that the inversion preserves the hyperbolic distance.

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