

History of Mathematical Ideas

Quiz 11

Name: _____

You have 10 minutes to complete this quiz. If you have a question raise your hand and remain seated. In order to receive full credit your answer must be **complete**, **legible** and **correct**. Show your work, and give adequate explanations.

1. Describe the Poincare model of the hyperbolic plane. To do this, identify the points, lines, betweenness relation, rays, angles, angle measure, segments. For segment measure, explain how the cross ratio is involved:

$$(A, B; C, D) = \frac{\overline{AC}}{\overline{BC}} \cdot \frac{\overline{BD}}{\overline{AD}}$$

- points = Euclidean points interior to the unit disk.
- lines = (i) those portions of Euclidean lines which pass through the origin and which lie in the unit disk together with (ii) those portions of circular arcs lying in the unit disk for those circles that are perpendicular to the boundary of the disk.
- betweenness = inherited from Euclidean betweenness.
- ray \vec{AB} = set of all points on hyperbolic line through A and B except those points C such that A is between C and B .
- angle = a pair of rays
- angle measure = same as Euclidean angle measure.
- segment = set of points between two given points (in the hyperbolic sense of betweenness), along with the two given points.
- segment measure = measured with metric $d(A, B) = -\ln((A, B; C, D))$ where C and D are the intersection points of the circle/line defining the hyperbolic line through A and B with the boundary of the unit disk.