Some Math 360 sample questions for review

Incidence, Euclid's and Hilbert's axioms will be provided if needed.

Q 1 (all the earlier sample questions, about models, Euclidean rigid motions, symmetries, and inversions in the Euclidean plane)

Q 2 Does the product of inversion in the circle of radius 1 centered at the origin with inversion in the circle of radius 2 centered at the origin have any fixed points? If so, find them.

Q 3 Find the hyperbolic length of the Euclidean straight segment from $(1, 2)$ to $(2, 6)$,

Q 4 An isoscoles right triangle has vertices at $(0, 2)$ and $(0, 4)$. Find a possible location for a third vertex.

Q 5 Show that not every translation of the plane is a hyperbolic rigid motion.

Q 6 Set up an integral to find the length of the circle centered at the origin of radius 2 in the Riemannian metric $ds^2 = 4x^2dx^2 + 3y^4dy^2$.

Q 7 Find a point E such that the segment BE is congruent to the segment CD and such that B is between A and E if C is the point $(2, 1)$, D is the point $(2, 100)$, A is the point $(0, 2)$ and B is the point $(0, 1)$, in the hyperbolic plane. You can do it in the Euclidean plane as well.

Q 8 Show that Euclid's Postulate 4 holds in the hyperbolic plane. That is, show that all hyperbolic right angles are hyperbolically congruent to each other.

Q 9 Find the angles of a hyperbolic triangle with vertices at $(0, 1)$, $(0, 5)$ and $(3, 4)$.

Q 10 Find the center and radius of a bowed geodesic which makes a $45\,\text{deg}$ angle with the bowed geodesic centered at the origin passing through $(2, 1)$.

Q 11 Construct a hyperbolic triangle with an altitude which is a vertical geodesic.

Q 12 State the definition of standard position for a hyperbolic triangle and show that every hyperbolic triangle is congruent to a hyperbolic triangle in standard position.

Q 13 Find the area of the vertical strip between $x = 3$ and $x = -3$ which is above the circle of radius 5 centered at the origin.

Q 14 Set up an integral to find the area of the hyperbolic circle of hyperbolic radius 1 centered at $(0, 2)$. Set up an integral to find the circumference of that circle as well.