

This note, that [was found here](#), as a part of [a collection](#) is written (completely with human hands) by [Rupadarshi Ray](#), was created on November 14, 2025 12:50:25 PM, was last modified on January 29, 2026 3:36:59 PM, and was exported on September 7, 2026 2:50:36 PM.

Hyperboloid model of $\mathbb{R}H^n$

geodesics

Proposition: Let $p \in \mathbb{R}^{\text{hyp}}$, q be the defining quadratic form and $v \in T_p\mathbb{R}^{\text{hyp}}$ be a non-zero vector. Then the *great hyperbola* in the plane $\mathbb{R}\langle p, v \rangle$ is the geodesic on the hyperboloid:

$$\exp_p(tv) = (\cosh \sqrt{q(v)}t)p + (\sinh \sqrt{q(v)}t)\frac{v}{\sqrt{q(v)}}$$

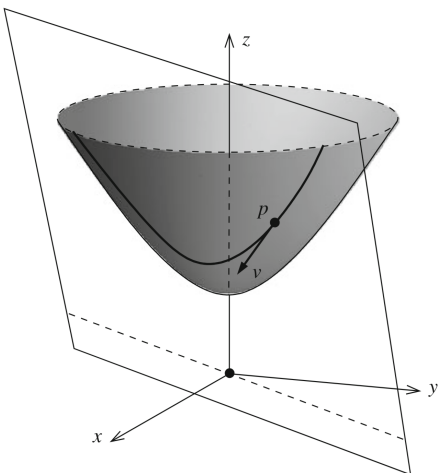


Fig. 5.5: A great hyperbola

[1]

Current note has 0 direct children and 0 total descendants.

- [squishy](#)
 - $\mathbb{R}H^n$
 - [Hyperboloid model of \$\mathbb{R}H^n\$](#)

And it has 5 siblings.

- [squishy](#)
 - $\mathbb{R}H^n$
 - [Hyperbolic ball model](#)
 - [Conic neighborhood](#)
 - [Hyperboloid model of \$\mathbb{R}H^n\$](#)
 - [Hyperboloid model to ball model of \$\mathbb{R}H^n\$](#)
 - [Types of isometries of \$\mathbb{R}\$ -hyperbolic space](#)

1. [John M Lee.Introduction to Riemannian Manifolds-Springer \(2018\),,p.139](#) ↔