$$s^2 = c^2(\Delta t)^2 - (\Delta x)^2$$

Consider two events at the same time, separated by D. Then $s^2 = -D^2$

$$\Delta t = 0 \qquad \Delta x = D \qquad s^2 = -D^2 \checkmark$$

-> clicker question

ANSWER $\quad t=0,\ x=D \xrightarrow{LT}$

$$\tilde{t} = \gamma\left(0 - \frac{v}{c^2}D\right) = -\gamma\frac{v}{c^2}D$$

$$\hat{x} = \gamma(D - v0) = \gamma D$$

$$c^2(\Delta\tilde{t})^2 - (\Delta\bar{x})^2 = \gamma^2\frac{v^2}{c^2}D^2 - \gamma^2 D^2 = \gamma^2\left(\frac{v^2}{c^2} - 1\right)D^2$$

$$= \frac{1}{1 - v^2/c^2}\left(\frac{v^2}{c^2} - 1\right)D^2 = -D^2$$

Consider two events at the same place, separated by time T. Then $s^2 = T^2$

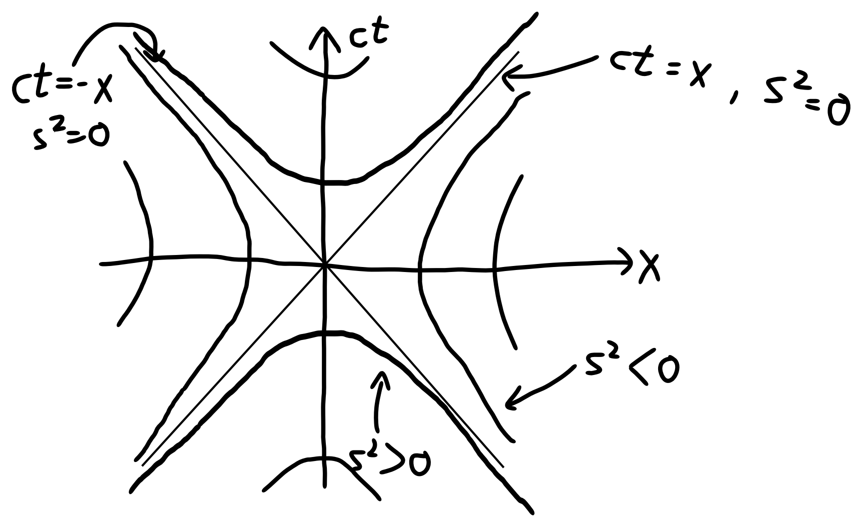
-> clicker question

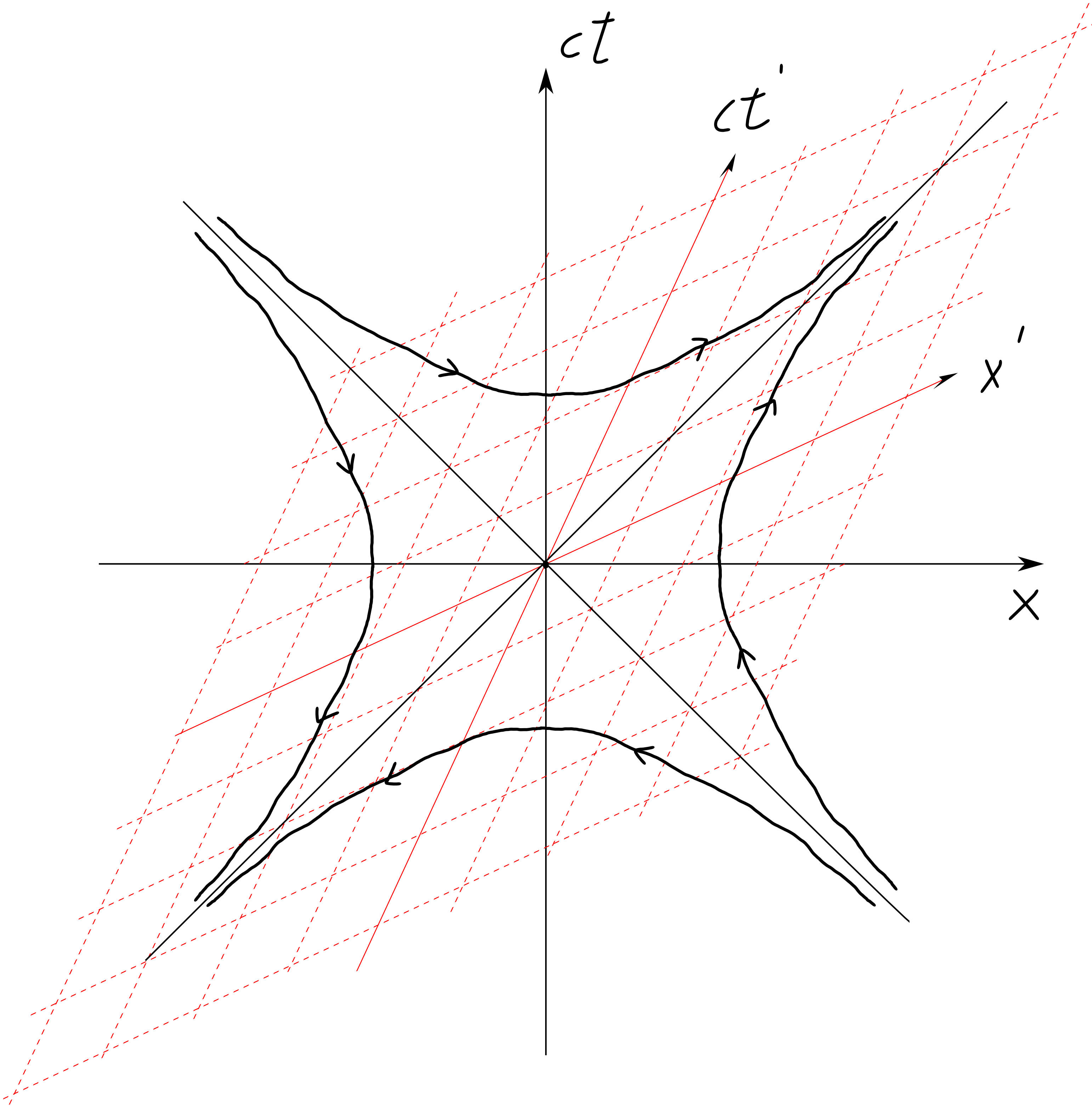
Conjecture: spacetime interval is invariant under Lorentz Trasformations - true! I will leave the details of the proof (straightforward if a bit tedious) for the next Problem Set

-> clicker question

change gears: clicker question

Notice the similarity to the Lorentz transformations. So, what do LT do?
The minus sign means that instead of moving on a circle, the trasformation moves along a hyperbola.
Instead x^2+y^2 = invariant, we have $(ct)^2 - x^2$ = invariant





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