

A Straight Line is the Shortest Distance Between Two Points?

Let's look at some more interesting features of the geometry of spacetime

A relatively close star is 5 light-years away, according to you, and is at rest in your reference frame. On the spacetime diagram below plot worldlines for the following, all of whom start at the same time:

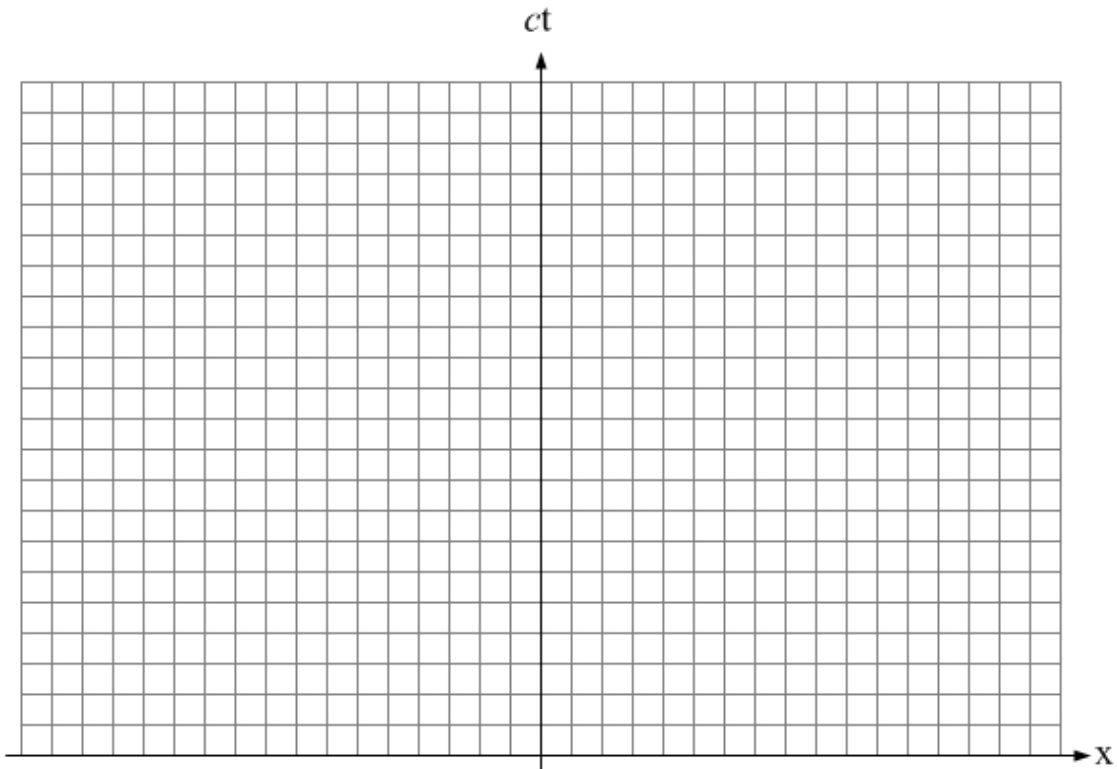
You, who remain at rest the whole time.

A beam of light that you send toward the star, which reflects off a mirror mounted next to the star and back to you.

Ken, who travels to the star and back at a speed of $0.8c$, according to you.

Lily, who travels to the star and back at a speed of $0.6c$, according to you.

Marco, who travels to the star and back at a speed of $0.5c$, according to you.



What is the distance of the various round-trips, according to the people who make the trips? The distance according to ...

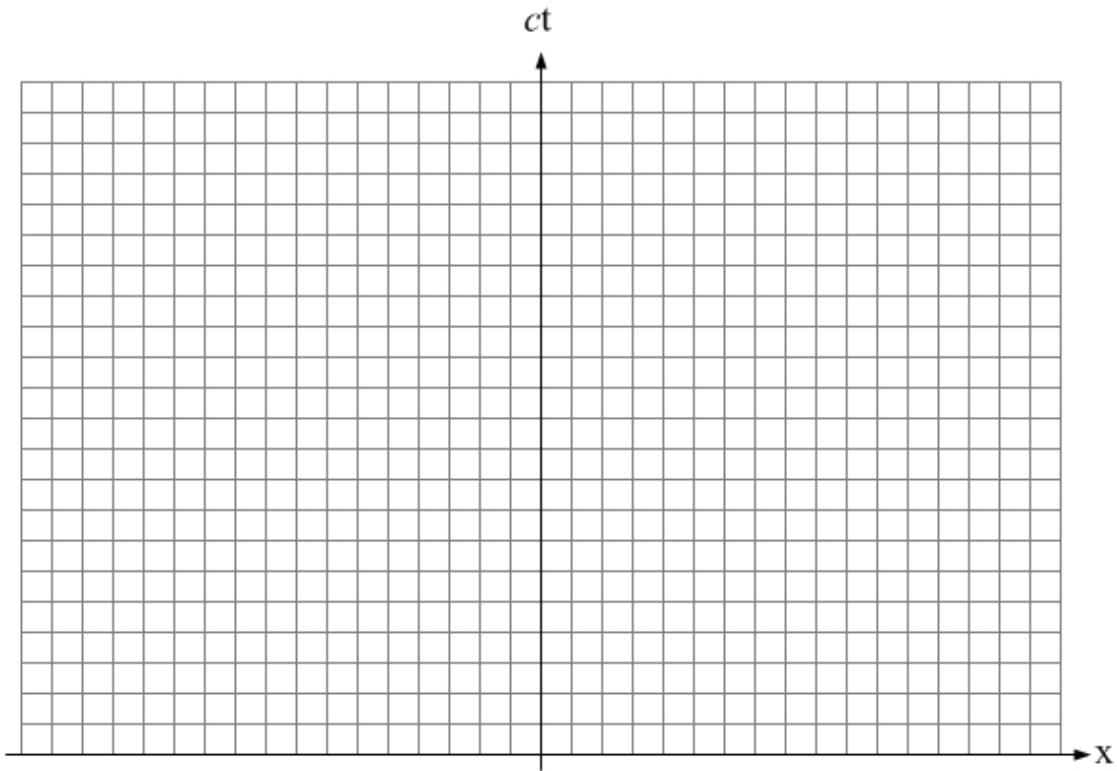
the light is _____ Ken is _____

Lily is _____ Marco is _____

You is _____

Now let's try something a little different. The light, and You, do exactly what they did the previous time. However, according to you Ken, Lily, and Marco reverse their directions at the same time the light does so that everyone (and the light) arrives back at your position at the same time.

Plot the various worldlines now. This time we can use a different scale, to cover more of the graph.



How long does the round trip take according to:

the light _____ Ken _____

Lily _____ Marco _____

You _____