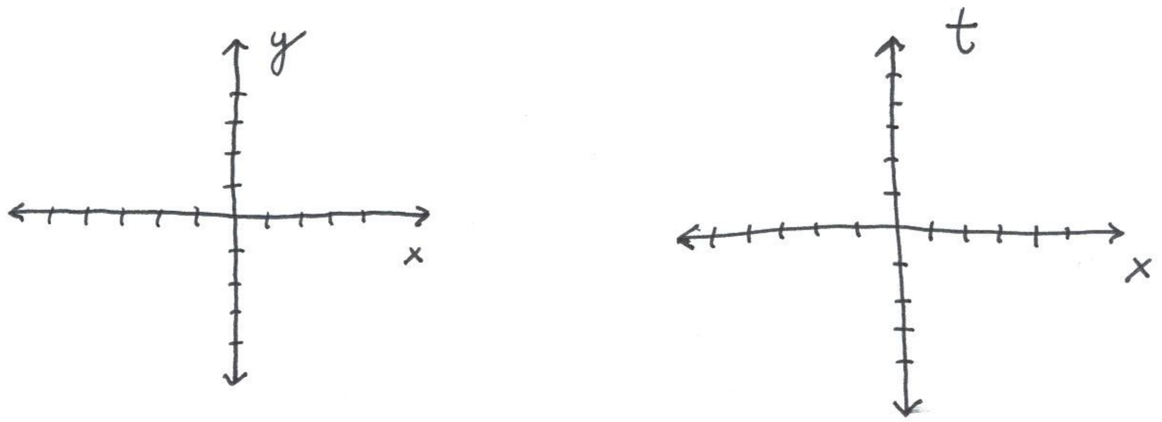
below). This 4-dimensional space is a flat space (unlike the 4 dimensional space of General Relativity), but it is not a 4-dimensional Euclidean space. It is not just a simple extension of the 3-d Euclidean world that you are familiar with to a 4th dimension. The space of Special Relativity is called a Minkowski space sometimes called "spacetime". So, what is so different about a Minkowski space from a Euclidean space? Well, a key concept in Special Relativity is to understand that even in the strange 4-dimensional Minkowski space called "spacetime" where you have 3 spatial dimensions and one time dimension, length is still an invariant. All you need to know is how to express the concept of length in this strange 4-dimensional space. And it is here that we see the principal difference between a 4-dimensional Euclidean space and a 4-dimensional Minkowski space. The distance formula in Minkowski space is NOT given by $\Delta x^2 + \Delta y^2 + \Delta z^2 + c^2\Delta t^2$, where we have multiplied the time displacement, Δt, by a factor of c, the speed of light, so that c Δt has the same units of length as Δx, Δy, and Δz. In 4-d Minkowski space or spacetime, lengths can only be invariant from coordinate system to coordinate system if they are described by

$$\Delta x^2 + \Delta y^2 + \Delta z^2 - c^2\Delta t^2$$

That minus sign makes all the difference in the world and that is why Minkowsky space is so different from the 3-d Euclidean space that we are so accustomed to. I can't draw the 4-d spacetime coordinate system, so I will cheat a bit and represent it two-dimensionally with the x-axis representing the 3 spatial coordinates and the old y-axis representing the time coordinate. Be sure that you understand that the 2-d Cartesian space on the left below is NOT AT ALL like the 2-d Minkowsky space on the right. The reason has to do with that pesky minus sign in the formula above.



The coordinate system on the right is called a spacetime diagram and we need to know how to plot the trajectory of objects on these types of diagram. If you are standing still, your position in the 3 spatial coordinates (represented by the x-axis in the spacetime diagram) will not change. So, if you are at point 3, you will stay at point 3. However, time is passing even if you are standing still, so your "path" in the spacetime diagram is represented by a straight line as shown below. Make sure you understand this concept or nothing after it will make sense. If you don't understand it, come see me.