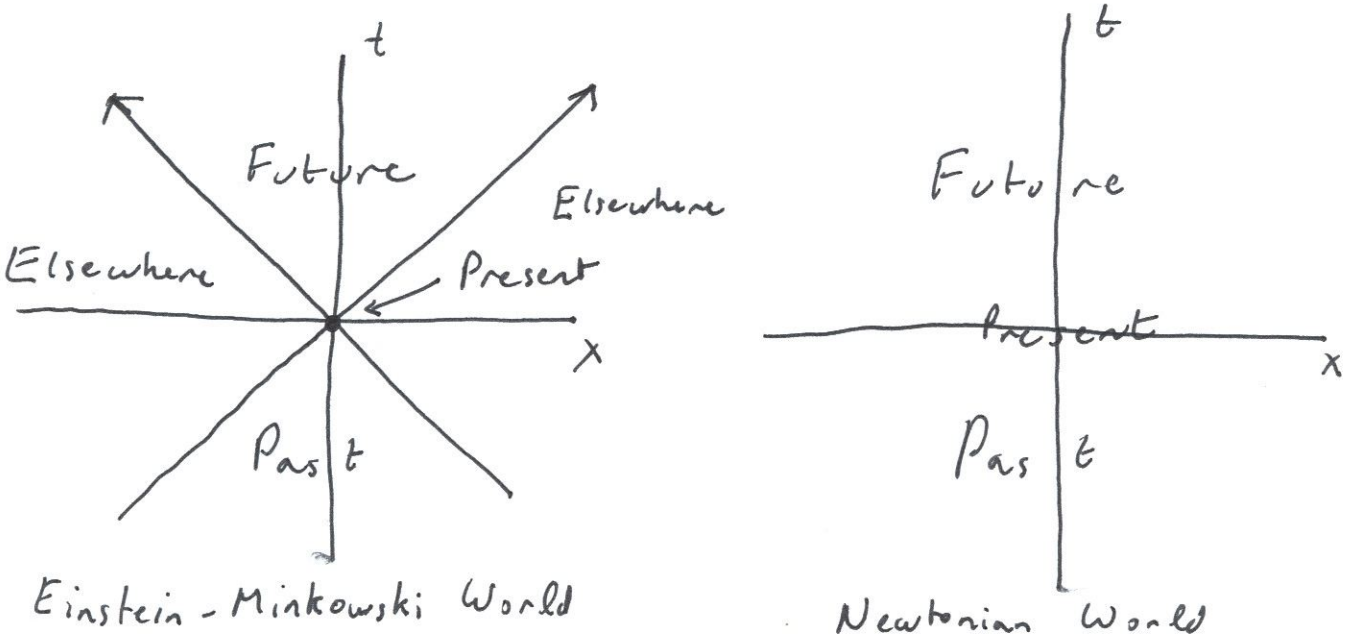
One of the key issues in Special Relativity is understanding why time is not the same for a moving observer when viewed by a stationary observer. With the help of spacetime diagrams, we can see that this problem, along with the problem of deciding what moving and stationary observers mean by simultaneous events, boil down to the inability of the two observers to agree on what equivalent time intervals are. This results from their different positions in spacetime.

Let's begin our exploration by defining the proper time to be the time that someone measures in his/her own frame of reference. In other words, this is the time ticked by THEIR clock attached to THEIR person (that means it's in their frame of reference). Because this clock is not moving with respect to the person to whom it is attached, the interval, s^2, for this observer is just $c^2\Delta t^2$ (because $\Delta x = \Delta y = \Delta z = 0$).

Because of the postulate in Special Relativity that nothing can go faster than light, the spacetime diagram has areas in it which are not accessible to an observer. In other words, there are regions from which information could not reach the observer unless it was traveling faster than light, so these regions are "off-limits" to the observer and we'll call them "Elsewhere". In a spacetime diagram, the Past, the Present, the Future, and the Elsewhere region are shown below for an observer at point 3 along the spatial coordinate. In the Newtonian world, where signals can travel infinitely fast, there is no elsewhere region and that world also is shown in the figure below.



With all this machinery, let's tackle the so-called Twin Paradox problem. Basically, you and your twin live the same type of life until you're both 20 years old (so your worldlines almost overlap the whole time) and then your twin goes off on a spaceship to a nearby star and comes back 16 years later when you, the twin that remained on Earth, are 36 years old. Your twin gets out of the spaceship and is only 33 years old, so you are a bit upset by this. Special Relativity says that what happened was that because the twin that