SR Units and Spacetime Diagrams

Physics II: Modern Physics

College of the Atlantic

1. The earth is around 93 million miles from the sun. How many light minutes is this?
2. The speed of the earth's orbit in a reference frame attached to the sun is around 30 km/s. What is the earth's speed in SR units?
3. A car travels at 60 miles per hour. What is this speed in SR units?
4. The following questions refer to the worldlines shown in the figure below.
   (a) Which worldline is not physically possible?
   (b) Which worldline shows an object at rest?
   (c) Which worldline has the largest speed?
   (d) Which worldline has a negative velocity?
5. Draw a qualitatively accurate spacetime diagram for the following scenario. Anastajia and Beowulf are on the opposite ends of a train station. They see each other and run quickly right at each other. They briefly embrace, and then walk slowly together to the right.
6. Draw a quantitatively accurate spacetime diagram for the following scenario. There is a starbase at the origin, and 6 light seconds to the right there is an planet on which Anastajia is visiting. At $t = 2$ s Beowulf sends a light flash toward the planet. As soon as the light flash is received by Anastajia, she gets in her spaceship and returns to the starbase traveling at a speed of 0.5. When does Anastajia leave, and when does she arrive?

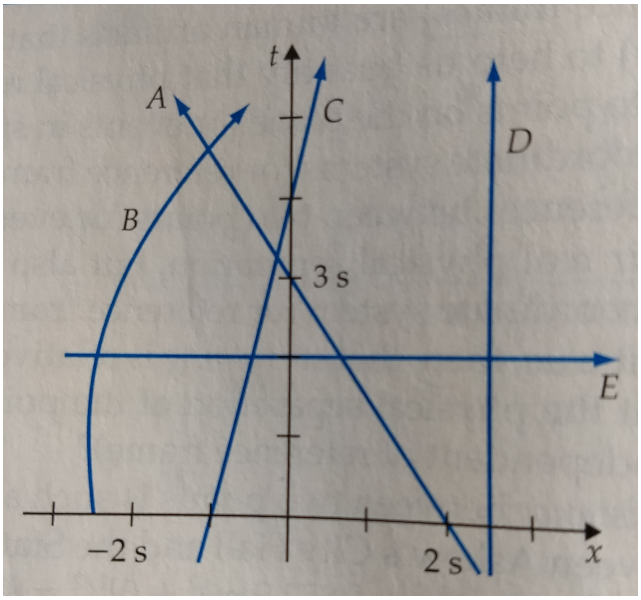

Figure 1: Figure R2.12 from Thomas A. Moore, *Six Ideas that Shaped Physics: Unit R (3rd ed.)*, McGraw Hill, 2017.