Dr. Sasha

Please, solve this problem and also show the steps to solve it.

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1) Why is our Moon drifting away while Mars' moons are falling?

2) Which is more rare: Lunar eclipse or Solar eclipse?

3) During the day a train passes a ground observer moving at velocity $\beta = 0.9 \cdot c$. The observer measures its length to be 20 m. When the train returns and parks at night in the station how long a parking space does it need?

Hint: the space and time coordinates of an event recorded in two inertial frames whose axes are parallel, and whose origins coincide at time zero (in both frames), are related by the equations:

$$x' = \gamma \cdot (x - V \cdot t)$$
$$y' = y$$
$$z' = z$$
$$t' = \gamma \cdot \left(t - \frac{V \cdot x}{c^2} \right)$$

In these equations the primed frame is taken to be moving with speed V in the x

direction with respect to the unprimed frame $\left(\gamma = \dfrac{1}{\sqrt{1 - \left(\dfrac{V}{c} \right)^2}} \right)$.

4) At what speed does a clock move if it runs at a rate which is one-half the rate of a clock at rest?

5) The average lifetime of a π meson in its own frame of reference is 26.0 ns. (This is its proper lifetime.) If the π meson moves with speed 0.95 c with respect to the Earth, what is its lifetime as measured by an observer at rest on Earth?

What is the average distance it travels before decaying as measured by an observer at rest on Earth?