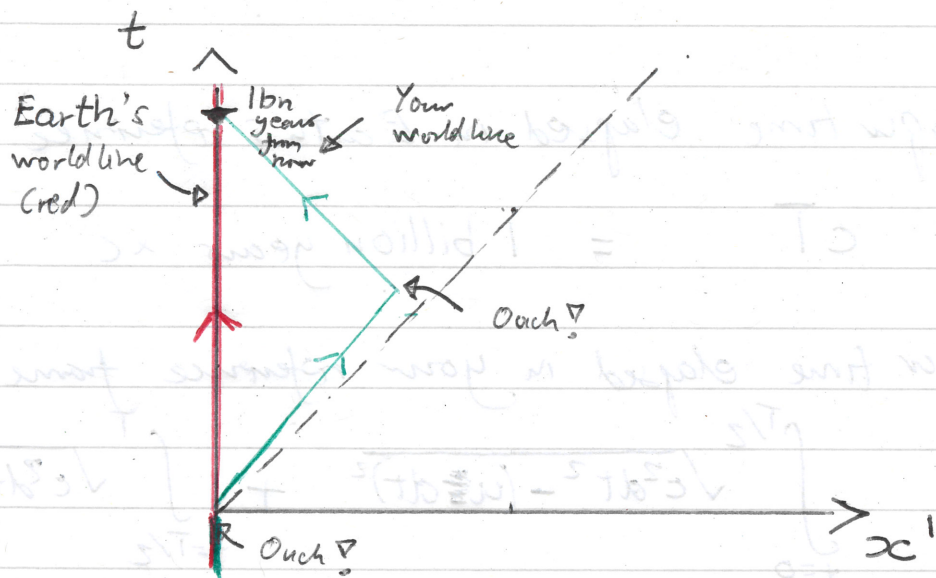


I want to see the future^{of Earth} in a billion years, I have a rocketship with unlimited acceleration and unlimited fuel, what trajectory in space should I follow?

I suppose you don't have ~~unlimited~~ time also got immortality (unlimited lifetime) and unlimited patience, so you probably what your trip in your frame of reference to take no more than say twenty years.



Schwarzschild space time

$$ds^2 = -dt^2 -$$

Minkowski spacetime

Proper time

$$-d\tau^2 = ds^2 = -cdt^2 + (dx^1)^2 + (dx^2)^2 + (dx^3)^2$$

Time you experience
 $\Rightarrow \tau =$

$$\int_{\text{Path, } \Gamma} \sqrt{cdt^2 - (dx^1)^2}$$

Earth worldline

$$x_E = (ct, 0, 0, 0)$$

Your worldline

$$x_{\text{you}} = \begin{cases} (ct, ut, 0, 0) & t \leq T/2 \\ (ct, -ut, 0, 0) & t > T/2 \end{cases}$$

Proper time elapsed in Earth's reference frame

$$\tau_E = cT = 1 \text{ billion years} \times c$$

Proper time elapsed in your reference frame

$$\tau_{\text{you}} = \int_{t=0}^{T/2} \sqrt{c^2 dt^2 - (u dt)^2} + \int_{t=T/2}^T \sqrt{c^2 dt^2 - (-u dt)^2}$$

$$= \frac{2}{\cancel{2}} \sqrt{c^2 - u^2} \left(\int_{t=0}^{T/2} dt + \int_{t=T/2}^T dt \right)$$

$$= \sqrt{c^2 - u^2} T$$

If you want the journey to last no more than
 $\tau_{\text{you}} = 20 \text{ years}$

$$\frac{\tau_{\text{you}}}{\tau_E} = \frac{20}{1 \times 10^9} \frac{\cancel{c^2 - u^2}}{\cancel{c^2}} \sqrt{1 - \frac{u^2}{c^2}}$$

$$\Rightarrow \frac{u^2}{c^2} = 1 - (2 \times 10^{-8})^2$$

$$\begin{aligned}\frac{u}{c} &= (1 - (2 \times 10^{-9})^2)^{\frac{1}{2}} \\ &\approx 1 - \frac{1}{2} \times 4 \times 10^{-16} \\ &= \underbrace{0.99 \dots 9}_{15 \text{ nines}} 8 \text{ times the speed of light}\end{aligned}$$

\Rightarrow To see the Earth in 1 billion years from now, if you are prepared to take 20 years ~~being accelerated~~ & undergo extreme forces of acceleration in a rocketship to get there, simply accelerate to

$\underbrace{0.99 \dots 9}_{15 \times} 8$ times the speed of light for 10 years

instantaneously, keep travelling in some direction for 10 years, then after 10 years, reverse your engines & accelerate to the same speed going ~~in the opposite~~ back to Earth instantaneously. Keep going for another 10 years & you will see Earth in 1 billion years!

1. The first step in the process of the scientific method is to ask a question.

2. The second step is to do background research on the topic.

3. The third step is to form a hypothesis, which is a prediction about the outcome of the experiment.

4. The fourth step is to design an experiment to test the hypothesis.

5. The fifth step is to conduct the experiment and collect data.

6. The sixth step is to analyze the data and draw conclusions.

7. The seventh step is to communicate the results of the experiment.

8. The eighth step is to repeat the experiment to verify the results.

9. The ninth step is to apply the results of the experiment to other situations.

10. The tenth step is to use the results of the experiment to develop new questions.

11. The eleventh step is to use the results of the experiment to develop new hypotheses.

12. The twelfth step is to use the results of the experiment to develop new experiments.

13. The thirteenth step is to use the results of the experiment to develop new theories.

14. The fourteenth step is to use the results of the experiment to develop new laws.

15. The fifteenth step is to use the results of the experiment to develop new models.

16. The sixteenth step is to use the results of the experiment to develop new technologies.

17. The seventeenth step is to use the results of the experiment to develop new products.

18. The eighteenth step is to use the results of the experiment to develop new services.