
Fun Template 2

Senan Sekhon

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Conventions

\mathbb{F} denotes either \mathbb{R} or \mathbb{C} .

\mathbb{N} denotes the set $\{1, 2, 3, \dots\}$ of natural numbers (excluding 0).

Inner products are taken to be linear in the first argument and conjugate linear in the second.

The Einstein summation convention is used for tensors unless otherwise specified.

1 Introduction

1.1 Scale

1.2 Speed

1.3 Speed of Light

1.4 Units

1.5 The Mathematics of Speed

[1]

2 Kinematics*

2.1 Relativity of simultaneity

2.1.1 Observations vs. Reality

2.1.2 Calculating time difference

2.2 Time in motion

2.2.1 How fast does time slow?

2.2.2 The mathematics of slow time

2.2.3 Time dialtion

2.2.4 Experimental evidence

2.2.5 Intuitive explanation

2.3 Length Contraction

2.3.1 motions effect on space

2.3.2 motions effect on space: mathematical form

2.3.3 example on length Contraction

2.3.4 example: disintegrating muons

2.3.5 Distant spaceflight

2.3.6 horizontal light clock

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3 Paradoxes

3.1 Pole in the Barn Paradox

3.1.1 description

3.1.2 Quantitative Details

3.1.3 Spacetime diagrams

3.1.4 Locking doors

3.2 The Twin Paradox

3.2.1 description

3.2.2 without acceleration

3.2.3 spacetime diagrams

3.2.4 twins communication

3.2.5 Relativistic Doppler effect

3.2.6 twins communication: Quantitative

3.3 Theoretical Minimum Dr. Jawad Problem

4 Momentum and Energy

4.1 Implications for mass

4.2 Force and Momentum

4.3 Relativistic Kinetic energy

4.4 $E=mc^2$

References

- [1] Joseph L. Taylor. *Complex Variables*. AMS, 2011. ISBN: 978-0-8218-6901-7.