

relativity.sty
Relativistic calculations and plots
for L^AT_EX2 ϵ

Unit Tests

Thomas Lahn

August 23, 2017

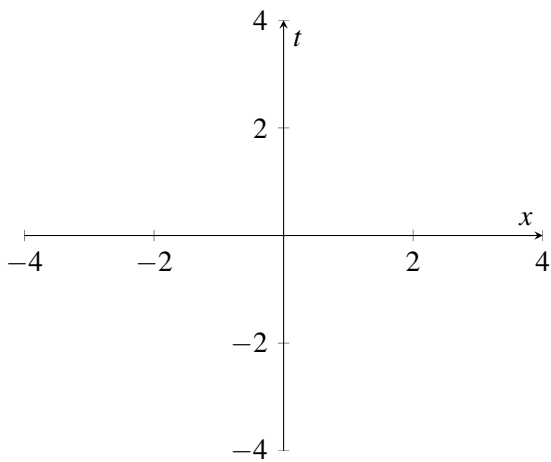
Contents

1	Calculations	1
2	Plots	1
2.1	Empty plot with default options: <code>\begin{spacetimeDiagram}...\end{...}</code> . . .	1
2.2	Light-like worldlines: <code>\lightlike[style][x_shift=0][t_shift=0]{speed}</code>	2
2.2.1	without options: <code>\lightlike</code>	2
2.2.2	with PGFPlots style option: <code>\lightlike[dotted]</code>	3
2.2.3	Positive shift in the x -direction: <code>\lightlike[][2]</code>	3
2.2.4	Negative shift in the x -direction: <code>\lightlike[][2]</code>	4
2.3	Lines of simultaneity: <code>\spatial[style][time][x_shift=0][t_shift=0]{speed}</code> . .	5
2.3.1	Non-zero speed: <code>\spatial{0.25}</code>	5
2.3.2	with PGFPlots style option: <code>\spatial[red]{0.25}</code>	6
2.3.3	Positive shift in the x -direction: <code>\spatial[][0][2]{0.25}</code>	6
2.3.4	Negative shift in the x -direction: <code>\spatial[][0][2]{0.25}</code>	7
2.3.5	Positive shift in the t -direction: <code>\spatial[][0][0][2]{0.25}</code>	8
2.3.6	Negative shift in the t -direction: <code>\spatial[][0][0][2]{0.25}</code>	9
3	Full Demo	9

1 Calculations

2 Plots

2.1 Empty plot with default options: `\begin{spacetime diagram}...\end{...}`



`spacetime diagram defaults:`

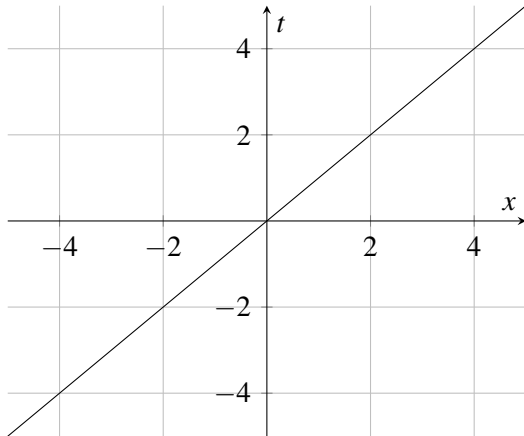
`axis x line=middle, axis y line=middle, xlabel=x, ylabel=t`

Pass Criteria

- Empty plot
- Axes in the middle
- Axes $x = -4..4$, $t = -4..4$

2.2 Light-like worldlines: `\lightlike[style][x_shift=0][t_shift=0]{speed}`

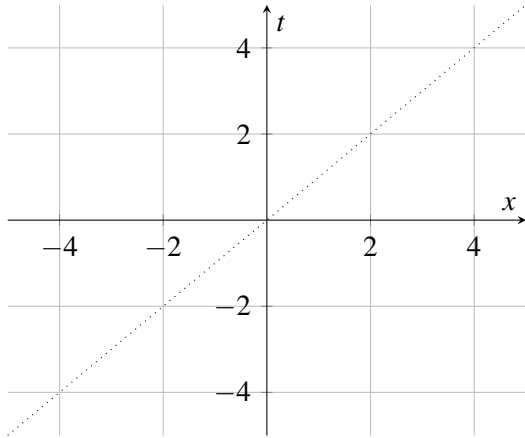
2.2.1 without options: `\lightlike`



Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, black, solid, thin line through origin at 45°

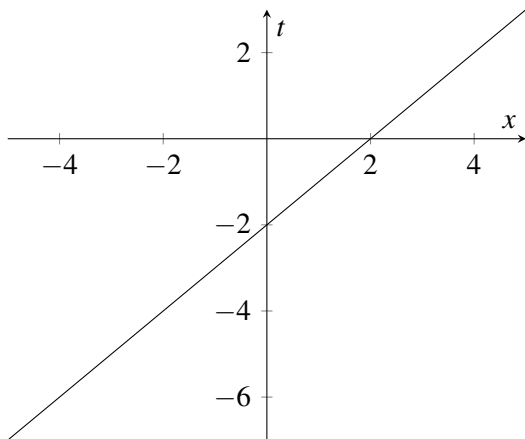
2.2.2 with PGFPlots style option: `\lightlike[dotted]`



Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, black, dotted, thin line through (0, 0) at 45°

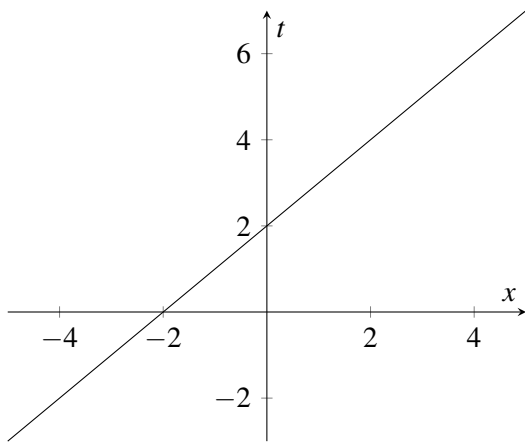
2.2.3 Positive shift in the x -direction: `\lightlike[][2]`



Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, black, solid, thin line through $(2, 0)$ at 45°

2.2.4 Negative shift in the x -direction: `\lightlike[][-2]`

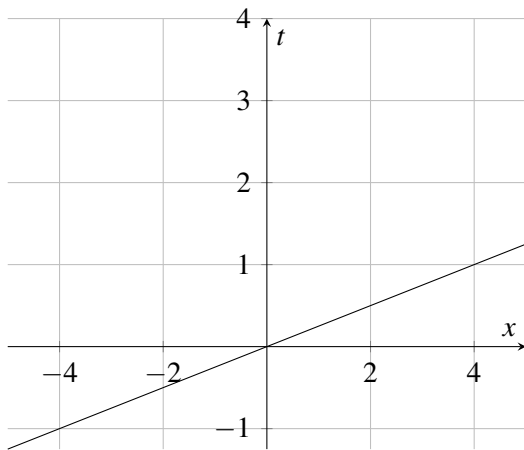


Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, black, solid, thin line through $(-2, 0)$ at 45°

2.3 Lines of simultaneity: $\backslash\text{spatial}[\text{style}][\text{time}][x_shift=0][t_shift=0]\{\text{speed}\}$

2.3.1 Non-zero speed: $\backslash\text{spatial}\{0.25\}$

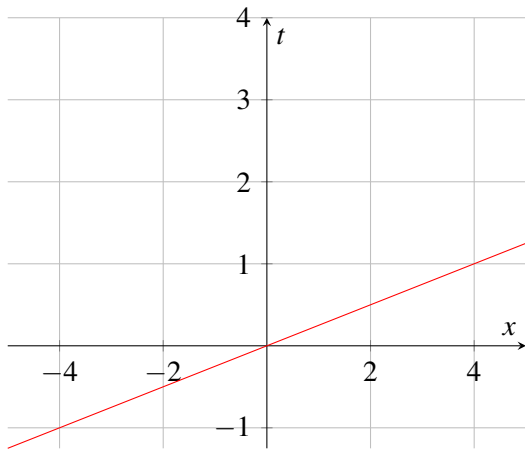


Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, black, solid, thin line through (0, 0) and (4, 1)

2.3 Lines of simultaneity: $\backslash\text{spatial}[\text{style}][\text{time}][\text{x_shift}=0][\text{t_shift}=0]\{\text{speed}\}$

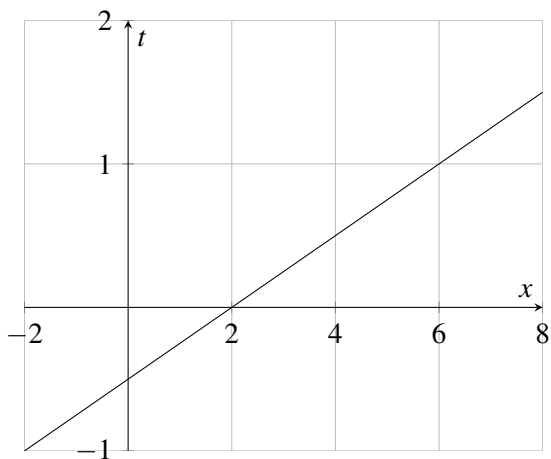
2.3.2 with PGFPlots style option: $\backslash\text{spatial}[\text{red}]\{0.25\}$



Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, red, solid, thin line through (0, 0) and (4, 1)

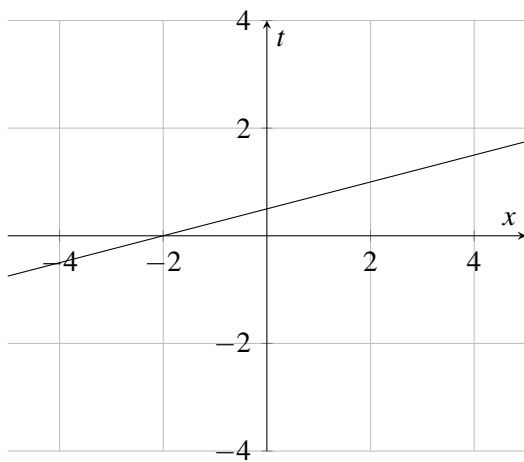
2.3.3 Positive shift in the x -direction: $\backslash\text{spatial}[][0][2]\{0.25\}$



Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, black, solid, thin line through $(2, 0)$ and $(6, 1)$

2.3.4 Negative shift in the x -direction: $\text{\spatial}[0][-2]\{0.25\}$

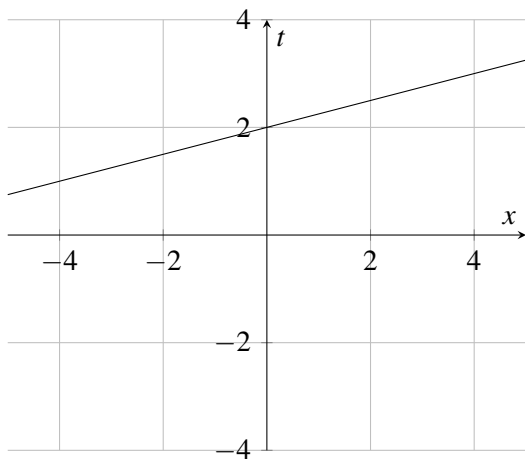


Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, black, solid, thin line through $(-2, 0)$ and $(2, 1)$

2.3 Lines of simultaneity: $\text{\spatial[style][time][x_shift=0][t_shift=0]\{speed\}}$

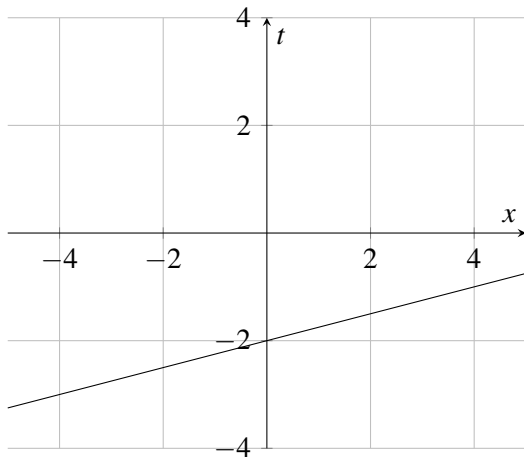
2.3.5 Positive shift in the t -direction: $\text{\spatial}[0][0][2]\{0.25\}$



Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, black, solid, thin line through $(-2, 0)$ and $(0, 2)$

2.3.6 Negative shift in the t -direction: $\text{\texttt{\textbackslashspatial}}[0][0][-2]\{0.25\}$



Pass Criteria

- Non-empty plot
- Axes in the middle
- Straight, black, solid, thin line through $(0, -2)$ and $(6, 0)$

3 Full Demo

$$v = 0.866025403784438637c$$

$$(x_A = 0, t_A = 4) \equiv (x_B = 6.928203230275508777, t_B = 7.999999999999999632)$$

