

GR notes

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Conventions

1. Greek index (e.g. α, β, μ, ν) take value from $\{0, 1, 2, 3\}$.
2. Events denoted by cursive capitals (e.g. $\mathcal{A}, \mathcal{B}, \mathcal{C}$).
3. $(x^0, x^1, x^2, x^3) \equiv (t, x, y, z) \equiv x^\alpha$
4. Latin index (e.g. i, j, k) take value from $\{1, 2, 3\}$.
5. New unit that speed of light $c = 1$

1 Chapter 0 – Special Relativity

1.1 Four Dimensional Spacetime

Definition 1.1. Inertial coordinate

The coordinate system must satisfy three property to be consider inertial coordinat:

1. The distance between two points are independent of time.
2. The clocks at every points ticking off time coordinate t at same rate.
3. The geometry of space is always Euclidean (flat).

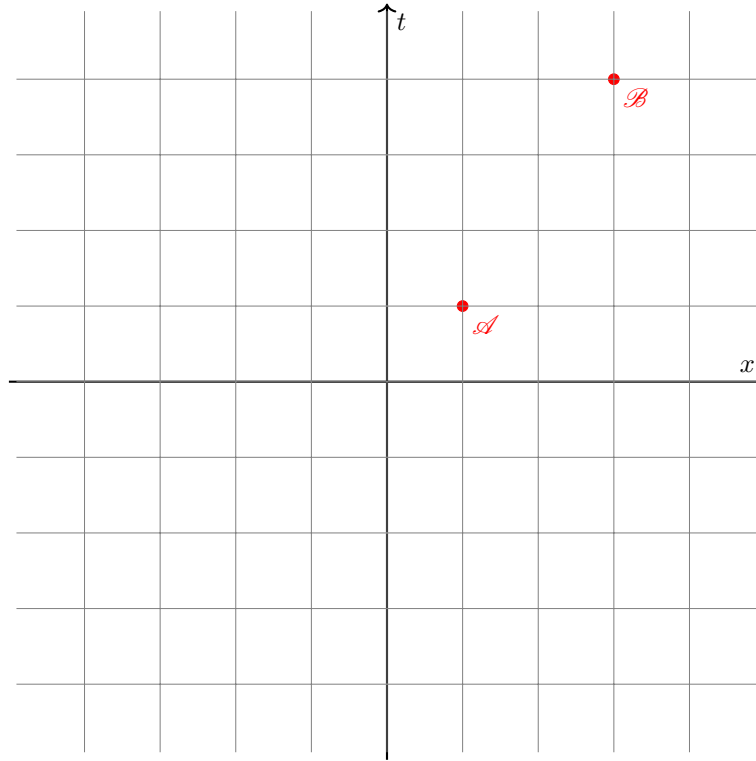


Figure 1: two events with coordinate $(1, 1, 0, 0)$ and $(4, 3, 0, 0)$.

The event in 4-D spacetime is define by a set of coordinate (t, x, y, z) . For simplicity, we assume those events have $y = 0, z = 0$.