

Chapter R3: The Nature of Time

R3.3 Coordinate Time is Frame Dependent

Coordinate Time is the time between two events measured in an inertial reference frame by a pair of synchronized clocks, one present at each event.

Relativity of Simultaneity: See Fig. R3.2.

R3.5: The Geometric Analogy

The coordinates x, y (or x', y') are frame dependent.

However, the distance between two points is frame independent:

$$\Delta d = \sqrt{\Delta x^2 + \Delta y^2} = \sqrt{\Delta x'^2 + \Delta y'^2} \quad (1)$$

R3.6 Proper Time and the Space Time Interval:

The *Proper Time* is the time measured between two events as measured by a single clock present at two events. The value of the proper time depends on the path the clock takes to get from one event to the other.

Note that “the” proper time between two events is not unique.

An *inertial clock* is a clock that moves at a constant velocity.

The *Spacetime Interval* is the time between two events measured by an inertial clock that's present at both events.

The spacetime interval is frame-independent in exactly the same way that the distance between two events is coordinate independent.