

2.1 Inertial Frames of Reference

Definition. A *frame of reference* is a system of spatial coordinates and possibly a temporal coordinate. A frame of reference in which the Law of Inertia holds is an *inertial frame* or *inertial system*. An observer at rest (i.e., with zero velocity) in such a system is an *inertial observer*.

Note. The main idea of an inertial observer in an inertial frame is that the observer experiences no acceleration (and therefore no net force). If S is an inertial frame and S' is a frame (i.e. coordinate system) moving uniformly relative to S , then S' is itself an inertial frame (see Exercise II-1). Frames S and S' are equivalent in the sense that there is no mechanical experiment that can be conducted to determine whether either frame is at rest or in uniform motion (that is, there is **no preferred frame**). This is called the *Galilean (or classical) Principle of Relativity*.

Note. Special relativity deals with the observations of phenomena by inertial observers and with the comparison of observations of inertial observers in equivalent frames (i.e., NO ACCELERATION!). General relativity takes into consideration the effects of acceleration (and therefore gravitation) on observations.

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