Gravity

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1 Introduction to Classical Mechanics

In Classical Mechanis (CM) time and space are treated as two distinct concepts. Events are identified by their position in some frame of reference, represented by a vector $\boldsymbol{r}$, and the time at which they occur, represented by a scalar t.
The simplest formulation of CM can be summarised in three laws and is based on the concept of **force**. A force $\boldsymbol{F}$ is a vector quantity representing an interaction between two bodies. This formulation is (unduly) credited to Newton because it was first published as a unified theory in the *Principia*.

N0 **Principle of Superposition:** the net force on a body is the vector sum of the individual forces acting on it.

N1 **Law of Inertia:** an inertial frame of reference is one where, in the absence of external interactions, bodies are in uniform linear motion.

N2 **Law of Acceleration:** in an inertial frame of reference the acceleration of a body is directly proportional to the net force acting on it.

N3 **Law of Reaction:** when a body exerts a force on another it is subject to a force equal in magnitude and opposite in direction produced by the second body.

Law **N2** can be used to introduce the concept of **inertial mass** m, which is taken as the proportionality constant between force and acceleration. The law can then be stated with the following equation.

$$\boldsymbol{F} = m\ddot{\boldsymbol{r}} \tag{N2}$$

2 Galilean gravity

The simplest theory of gravity in our possession is due to Galileo