

5.2: Gravitational Field

The region around a gravitating body (by which I merely mean a mass, which will attract other masses in its vicinity) is a *gravitational field*. Although I have used the words “around” and “in its vicinity”, the field in fact extends to infinity. All massive bodies (and by “massive” I mean any body having the property of mass, however little) are surrounded by a gravitational field, and all of us are immersed in a gravitational field.

If a test particle of mass m is placed in a gravitational field, it will experience a *force* (and, if released and subjected to no additional forces, it will *accelerate*). This enables us to define quantitatively what we mean by the *strength* of a gravitational field, which is merely the *force experienced by unit mass* placed in the field. I shall use the symbol \mathbf{g} for the gravitational field, so that the force \mathbf{F} on a mass m situated in a gravitational field \mathbf{g} is

$$\mathbf{F} = m\mathbf{g}. \quad (5.2.1)$$

It can be expressed in newtons per kilogram, N kg^{-1} . If you work out the *dimensions* of \mathbf{g} , you will see that it has dimensions LT^{-2} , so that it can be expressed equivalently in m s^{-2} . Indeed, as pointed out in section 5.1, the mass m (or indeed any other mass) will accelerate at a rate g in the field, and the strength of a gravitational field is simply equal to the rate at which bodies placed in it will accelerate.

Very often, instead of using the expression “strength of the gravitational field” I shall use just “the gravitational field” or perhaps the “field strength” or even just the “field”. Strictly speaking, the “gravitational field” means the region of space surrounding a gravitating mass rather than the field strength, but I hope that, when I am not speaking strictly, the context will make it clear.

This page titled 5.2: Gravitational Field is shared under a [CC BY-NC 4.0](#) license and was authored, remixed, and/or curated by [Jeremy Tatum](#) via [source content](#) that was edited to the style and standards of the LibreTexts platform.