

The wave equation is $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$

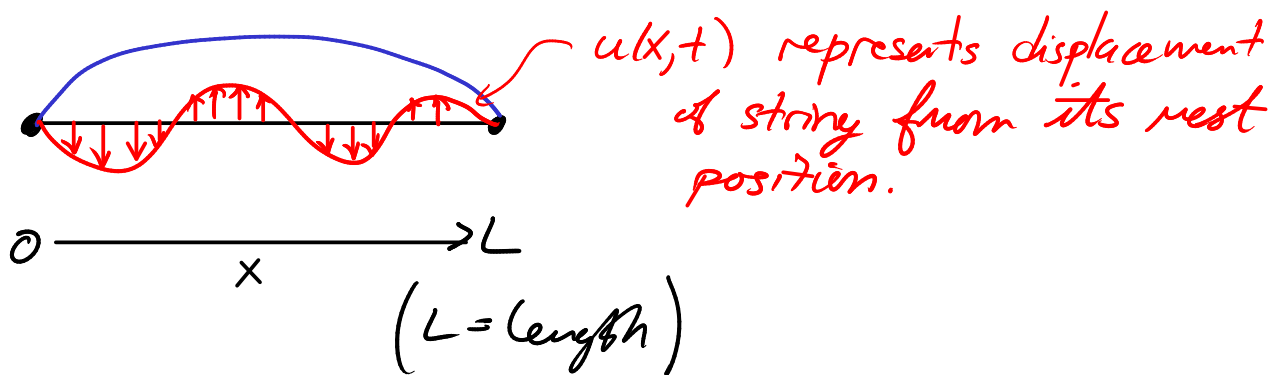
c is the speed of the wave; it depends on the medium.

Free wave propagation

$$u(x,t) = \underbrace{F(x-ct)}_{\text{right moving wave}} + \underbrace{G(x+ct)}_{\text{left moving wave}}$$

These waves have no boundary conditions, and they pass right through each other without interacting. They are "free".

We will be interested in a situation where the waves are confined, such as in a vibrating string:



The ends of the string are fixed. They don't get displaced. This translates into the boundary conditions

$$u(0,t) = 0 \quad , \quad u(L,t) = 0$$