Waves (ctd.)

\[ \nu = \frac{\lambda}{T} = \frac{\omega}{k} \]

\[ \omega = \frac{2\pi}{T} \quad k = \frac{2\pi}{\lambda} \]

Travelling waves \( \rightarrow x = A \cos(kx - \omega t) \)
right-travelling wave

Superposition
One can show that, for waves which involve a small displacement from equilibrium, so that the restoring force is proportional to the displacement, different waves travelling through the medium simply superpose.

e.g. on a string:

Standing waves
For rope waves at a wall, the point of attachment can't move \( \rightarrow \)
We require incident + reflected = 0 at all times at this point
\( \Rightarrow \) If incident = \( A \sin(kx - \omega t) \) then reflected = \( A \sin(kx + \omega t) \)

Wave reflections

Conservation of energy \( \rightarrow \) When a wave impinges on a surface which is unable to absorb energy, a reflection is generated with the same shape as the incident wave, but flipped left-right (because of causality). Depending on the type of surface generating the reflection, it can be inverted or not.

For string waves hitting a wall, reflection is inverted. Example: