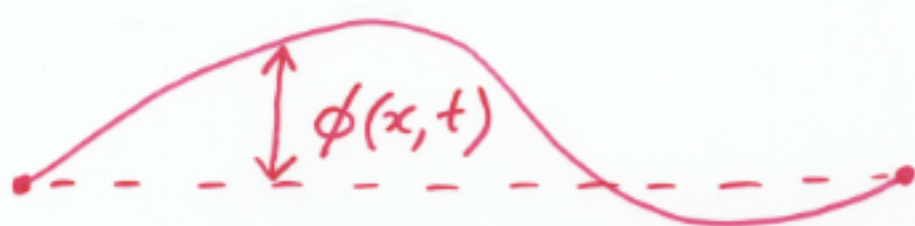


# LECTURE 2

L2

## Stretched string



Wave equation (PDE)

$$\frac{\partial^2 \phi}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 \phi}{\partial t^2}$$

with b.c.'s  $\phi(0, t) = \phi(L, t) = 0$

Separate variables: try  $\phi(x, t) = X(x)T(t)$

$$\Rightarrow \underbrace{\frac{1}{X} \frac{d^2 X}{dx^2}}_{x \text{ only}} = \underbrace{\frac{1}{c^2 T} \frac{d^2 T}{dt^2}}_{t \text{ only}} = \underbrace{-k^2}_{\text{constant}}$$

$$\Rightarrow \frac{d^2 X}{dx^2} = -k^2 X \qquad \frac{d^2 T}{dt^2} = -k^2 c^2 T$$

(2 ODE's)