

$$b) \quad b.c) \quad \left. \frac{du}{dx} \right|_{x=0} = 0 \quad \left. \frac{du}{dx} \right|_{x=L} = 0 \quad \left. \frac{du}{dt} \right|_{t=0} = 0 \quad u(x,0) = x$$

$$u(x,t) = X(x)T(t)$$

$$u_{xx} = u_{tt} \Rightarrow \frac{X''}{X} = \frac{T''}{T} = \text{constant} = -\lambda^2$$

$$X'(0) = 0 \quad X'(L) = 0$$

$$\cos(\lambda x) \rightarrow \sin(\lambda x) \quad \lambda = \frac{n\pi}{L}$$

$$X(x) = \cos\left(\frac{n\pi}{L}x\right) \quad \lambda = \frac{n\pi}{L}$$

$$X(x)T(t)$$

$$\cos\left(\frac{n\pi}{L}x\right) \begin{cases} \cos\left(\frac{n\pi}{L}t\right) \leftarrow \text{Position} \\ \sin\left(\frac{n\pi}{L}t\right) \leftarrow \text{velocity} \end{cases}$$

$$\sum_{n=0}^{\infty} \boxed{a_n} \cos\left(\frac{n\pi}{L}x\right) \cos\left(\frac{n\pi}{L}t\right)$$

$$\text{at } t=0 \quad \sum_{n=0}^{\infty} a_n \cos\left(\frac{n\pi}{L}x\right) = x$$

$$a_n = \frac{2}{L} \int_0^L x \cos\left(\frac{n\pi}{L}x\right) dx$$

Fourier cosine
coefficients of
x on [0, L]

Again, this
problem was NOT
completed.