

# Physics Problems: #1

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## Normal Modes in 1D<sup>1</sup>

### a. Discrete

Consider a system of  $N$  particles which is subject to a restoring force proportional to the separation to the equilibrium position ( $-F\alpha x$ ). How many normal modes has this system?

### b. Continuous

Consider now a continuous system of particles confined to a length  $L$  and fixed borders. Which are normal wave lengths ( $\lambda_n$ ), the normal frequencies ( $\nu_n$ ) in terms of  $\nu$  (the speed of waves in the medium) and is it correct to think that this system has infinite normal modes. If the it does not have infinite normal modes, give a order of magnitude of the number of normal modes.

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[1] A. P. French. Vibrations and Waves. 2003