Physics Problems: #1

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Normal Modes in 1D[1]

a. Discrete

Consider a system of N particles which is subject to a restoring force proportional to the separation to the equilibrium position ($F \quad \alpha \quad x$). 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 (λ_n), the normal frequencies (ν_n) in terms of ν(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