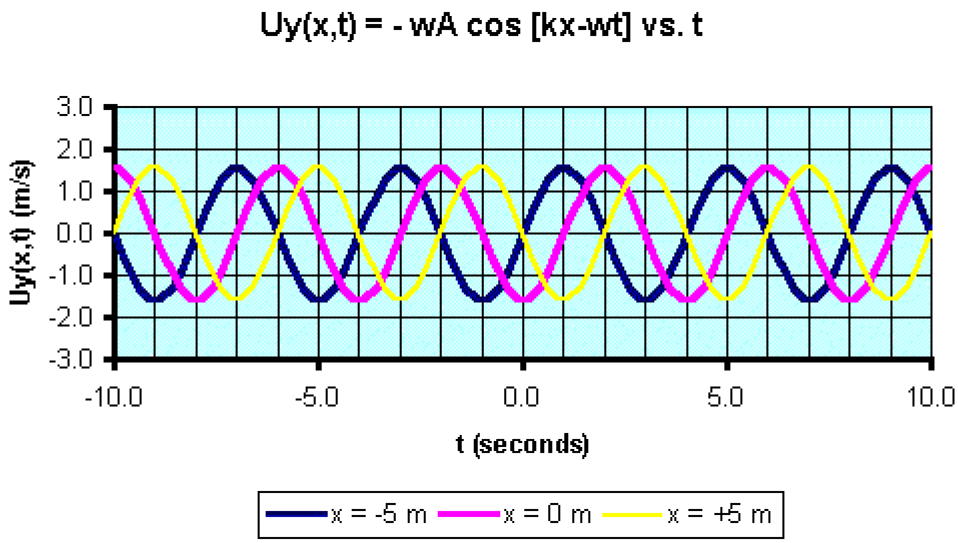
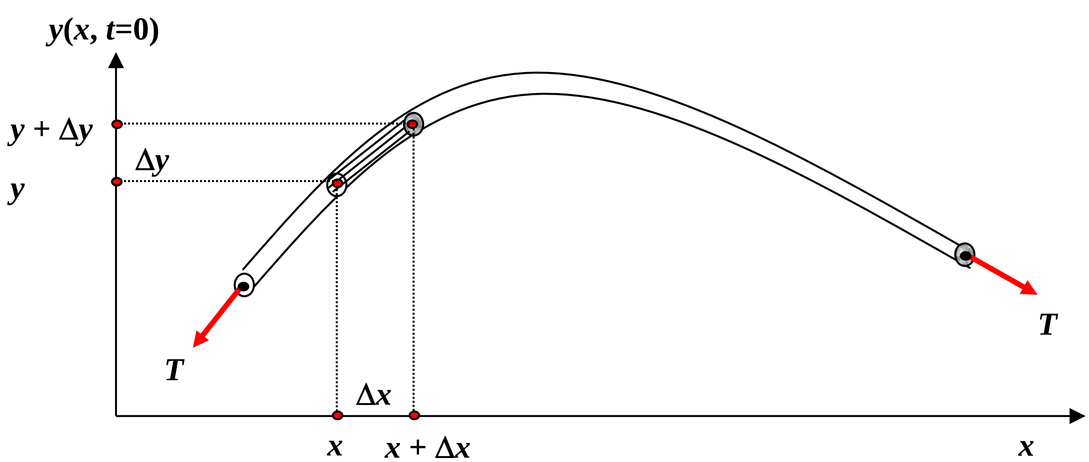


For the type of transverse waves we are used to dealing with on *e.g.* stringed instruments, such as the guitar, or violin, in order for propagation of transverse waves to occur on a string, the string must be stretched, with a tension (holding force), T. The mksa units of tension, T are the same as that for force, F - namely *Newtons* of force, or *Newtons* of tension. One Newton of force, by (Isaac) Newton's second law, $F = ma$, is equal to the force, F associated with accelerating a mass, $m = 1$ *kilogram* (*kg*) by an acceleration, $a = 1$ m/sec^2. Thus, one *Newton* = 1 kg m/sec^2.

The Wave Equation

There are many ways to derive the wave equation - a so-called 2nd order linear, homogeneous differential equation, which describes the propagation of waves associated with a physical system, for which there are no dissipative losses. For *small amplitude* transverse waves on a string, we can consider the balance of forces and accelerations associated with an infinitesimally small segment of the string, of length dx, as shown in the figure below, for a snapshot in time, *e.g.* at $t = 0$.



©Professor Steven Errede, Department of Physics, University of Illinois at Urbana-Champaign, IL, 2000 - 2017. All rights reserved.