

**PROBLEM 1:**

Assume that there is viscous damping distributed along a string as it vibrates. The damping coefficient per unit length is  $c$ . The density of the string is  $\rho$ , the tension is  $T$ , and the length is  $L$ . Derive the form of the transverse displacement free response,  $u(x,t)$ , of the string assuming the string is fixed at both ends.

**PROBLEM 2:**

Assume a solution of the form found in Problem #1 with  $c=0$ . Given the triangular displacement initial condition shown below with zero initial velocity, compute the free response along the string. Plot the solution using Matlab at  $t=0$  using 2, 3, 10, and 20 modes of vibration to determine the accuracy of the response. Assume  $U=5$  mm,  $L=1$  m, and  $c=1000$  m/s.

