Problem 1
Summarize the main equations associated with the finite element analysis of three-dimensional linear elastic bodies using 8-noded brick elements and linear isoparametric shape functions.

Problem 2
Use the following quadratic shape functions
\[ \hat{u} = N_1 \hat{u}_1 + N_2 \hat{u}_2 + N_3 \hat{u}_3 \]  
where
\[ N_1 = \frac{-t}{\ell} \left( 1 - \frac{2t}{\ell} \right); \quad N_2 = \frac{t}{\ell} \left( 1 + \frac{2t}{\ell} \right); \quad N_3 = 1 - \frac{4t^2}{\ell^2} \]
with three nodes 1, 2 and 3, and the local axis \( t \) taken as shown in Fig. 1. For the problem shown in Fig. 2, derive a general equation for the element stiffness matrix and traction load vector. Divide the rod into two elements, one from point A to point B and another from point B to point C, and form the global stiffness and load vectors. Impose the displacement boundary condition and solve for the displacement at points B and C. Compare your results with those obtained with linear shape functions (to be worked out in class) and comment on the results.