1. (i) A nonuniform bar of constant thickness is fixed at both ends and is subjected to an axial force $P$ as shown. Calculate the reaction forces of the bar at both ends and the displacement $u(x)$ as well as the stress $\sigma_x(x)$ in the bar. (10 points)

(ii) Solve the same problem again using the FEM with two-node uniform bar elements as shown. Compare the plots of $u(x)$ and $\sigma_x(x)$ with the solutions obtained in (i). (15 points)