

1D Eigenvalue Problems (Collocation method)

PDEs (must be linear):

$$\begin{aligned} F_1(x, U_1, U_{1x}, U_{1xx}, \dots, U_N, U_{Nx}, U_{Nxx}) &= \lambda \rho_{11}(x)U_1 + \dots + \lambda \rho_{1N}(x)U_N \\ &= \\ &= \\ F_N(x, U_1, U_{1x}, U_{1xx}, \dots, U_N, U_{Nx}, U_{Nxx}) &= \lambda \rho_{N1}(x)U_1 + \dots + \lambda \rho_{NN}(x)U_N \end{aligned}$$

Boundary conditions (at endpoints):

$$\begin{aligned} G_1(U_1, U_{1x}, \dots, U_N, U_{Nx}) &= 0 \\ &= \\ &= \\ G_N(U_1, U_{1x}, \dots, U_N, U_{Nx}) &= 0 \end{aligned}$$

(periodic and "no" boundary conditions are also permitted)