1D Eigenvalue Problems (Collocation method)

ODEs (must be linear):

$$\begin{aligned} F_1(x, U1, U1_x, U1_{xx}, ..., UN, UN_x, UN_{xx}) &= \lambda\rho_{11}(x)U1 + \cdots + \lambda\rho_{1N}(x)UN \\ . &= . \\ . &= . \\ F_N(x, U1, U1_x, U1_{xx}, ..., UN, UN_x, UN_{xx}) &= \lambda\rho_{N1}(x)U1 + \cdots + \lambda\rho_{NN}(x)UN \end{aligned}$$

Boundary conditions (at endpoints):

$$\begin{aligned} G_1(U1, U1_x, ..., UN, UN_x) &= 0 \\ . &= . \\ . &= . \\ G_N(U1, U1_x, ..., UN, UN_x) &= 0 \end{aligned}$$

(Periodic and "no" boundary conditions are also permitted.)