1D Steady-State Problems (Galerkin method)

ODEs:

$$\begin{aligned}
\frac{\partial}{\partial x} A_1(x, U1, U1_x, ..., UN, UN_x) &= F_1(x, U1, U1_x, ..., UN, UN_x) \\
. &= . \\
. &= . \\
\frac{\partial}{\partial x} A_N(x, U1, U1_x, ..., UN, UN_x) &= F_N(x, U1, U1_x, ..., UN, UN_x)
\end{aligned}$$

Boundary conditions (at endpoints):

$$\begin{aligned}
U1 &= FB_1 \\
. &= . \\
. &= . \\
UN &= FB_N
\end{aligned}$$

or ($N_x = -1$ at left end, $+1$ at right end)

$$\begin{aligned}
A_1 N_x &= GB_1(U1, U1_x, ..., UN, UN_x) \\
. &= . \\
. &= . \\
A_N N_x &= GB_N(U1, U1_x, ..., UN, UN_x)
\end{aligned}$$