**2.14** Using two linear elements solve the equations in problem (2.13) with $L = 1\ m$, $K = 200$ $w/mK$, $Q = 100\ W/m^3$, $h = 150\ W/m^2\ K$, $T_\infty = 100C$ and $q = 2{,}000\ W/m^2$

**Solution:**

Using Eqs. 2.19 and 2.30 $\frac{2K}{L}\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}\begin{Bmatrix}T_1\\ T_2\end{Bmatrix}-\frac{QL}{4}\begin{Bmatrix}1\\ 1\end{Bmatrix}-h\begin{Bmatrix}T_1-T_\infty\\ 0\end{Bmatrix}=\begin{Bmatrix}0\\ 0\end{Bmatrix}$ Substitute the parameters values 1) $\begin{bmatrix}250 & -400\\ -400 & 400\end{bmatrix}\begin{Bmatrix}T_1\\ T_2\end{Bmatrix}=\begin{Bmatrix}-14750\\ 25\end{Bmatrix}$ 2) $\begin{bmatrix}400 & -400\\ -400 & 400\end{bmatrix}\begin{Bmatrix}T_2\\ T_3\end{Bmatrix}=\begin{Bmatrix}25\\ 25-q\end{Bmatrix}$

assembling

1) $\begin{bmatrix}250 & -400 & 0\\ -400 & 800 & -400\\ 0 & -400 & 400\end{bmatrix}\begin{Bmatrix}T_1\\ T_2\\ T_3\end{Bmatrix}=\begin{Bmatrix}-14750\\ 50\\ 25-q\end{Bmatrix}$ With solution

$$T_1 = 97.833 + 0.0066667q$$
$$T_2 = 98.021 + 0.0041667q$$
$$T_3 = 98.084 + 0.0016667q$$