c) So the final matrix (including u_0 & u_4) would be

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & B & -A & 0 & 0 \\ 0 & -A & B & -A & 0 \\ 0 & 0 & -A & B & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} u_0^{j+1} \\ u_0^{j+1} \\ u_1^{j+1} \\ u_2^{j+1} \\ u_3^{j+1} \\ u_4^{j+1} \\ u_5^{j+1} \end{bmatrix} = \begin{bmatrix} u_0^{j+1} \\ u_1^{j} + \Delta t \cdot u_1^{j+1}(1 - u_1^{j+1}) \\ u_2^{j} + \Delta t + u_2^{j+1}(1 - u_2^{j+1}) \\ u_3^{j} + \Delta t + u_3^{j+1}(1 - u_3^{j+1}) \\ u_4^{j+1} \end{bmatrix}$$