# Problem Set 1.1

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**Question 27** Show how $B, T, K$ come from $A_0$, $A_1$, $A_2$ with 0,1,2 boundary conditions. $B$ is $A_0^T A_0$, second differences in $B$ from first differences in $A_0$:

$$A_0 = \begin{bmatrix} -1 & 1 & 0 & 0 \\ 0 & -1 & 1 & 0 \\ 0 & 0 & -1 & 1 \end{bmatrix} \quad \text{is a "}\textbf{forward difference matrix}\text{"}$$

Which column of $A_0$ would you remove to produce $A_1$ with $T = A_1^T A_1$? Which column would you remove next to produce $A_2$ with $K = A_2^T A_2$? The sizes of $B, T, K$ get smaller as unknowns are removed. The matrices change from positive *semidefinite* to positive definite. The columns of $A_1$ and $A_2$ become independent.