

$$\begin{bmatrix} -4 & 1 & 0 & 0 & 0 & 0 \\ 1 & -4 & 1 & 0 & 0 & 0 \\ 0 & 1 & -4 & 1 & 0 & 0 \\ 0 & 0 & 1 & -4 & 1 & 0 \\ 0 & 0 & 0 & 1 & -4 & 1 \\ 0 & 0 & 0 & 0 & 1 & -4 \end{bmatrix} \begin{bmatrix} v_0 \\ v_1 \\ v_2 \\ v_3 \\ v_4 \\ v_5 \end{bmatrix} \rightarrow \begin{bmatrix} -4v_0 + v_1 \\ v_0 - 4v_1 + v_2 \\ v_1 - 4v_2 + v_3 \\ v_2 - 4v_3 + v_4 \\ v_3 - 4v_4 + v_5 \\ v_4 - 4v_5 \end{bmatrix} \begin{array}{l} \text{Process } 0 \\ \text{Process } 0 \\ 1 \\ 1 \\ 2 \\ 2 \end{array}$$

Process 0 stores $[v_0 \ v_1]^T$ but needs v_2 to calculate the 1st index of $Av \Rightarrow$ Process 0 has $[v_0 \ v_1]^T$ plus $\text{recv-down} = v_2$.

Process 1 stores $[v_2 \ v_3]^T$ but needs v_1 and v_4 to calculate the 2nd and 3rd index of $Av \Rightarrow$ Process 1 has $[v_2 \ v_3]^T$ plus $\text{recv-up} = v_1$ and $\text{recv-down} = v_4$.

Process 2 stores $[v_4 \ v_5]^T$ but needs v_3 to calculate the 4th index of $Av \Rightarrow$ Process 2 has $[v_4 \ v_5]^T$ plus $\text{recv-up} = v_3$.