$$B = \begin{pmatrix} 2 & 0 & 4 & 0 & -2 \\ 3 & 1 & 0 & 1 & 0 \\ -1 & 0 & -1 & 0 & -2 \\ 0 & -1 & 0 & 0 & -6 \\ 0 & 0 & 1 & 0 & 4 \end{pmatrix} \begin{matrix} \\ -\frac{3}{2}\cdot \mathrm{I} \\ +\frac{1}{2}\cdot \mathrm{I} \\ \\ \\ \end{matrix}$$

$$B = \begin{pmatrix} 2 & 0 & 4 & 0 & -2 \\ 3 & 1 & -6 & 1 & 3 \\ -1 & 0 & 1 & 0 & -3 \\ 0 & -1 & 0 & 0 & -6 \\ 0 & 0 & 1 & 0 & 4 \end{pmatrix} \begin{matrix} \\ \\ \\ +1\cdot \mathrm{II} \\ \\ \end{matrix}$$

$$B = \begin{pmatrix} 2 & 0 & 4 & 0 & -2 \\ 3 & 1 & -6 & 1 & 3 \\ -1 & 0 & 1 & 0 & -3 \\ 0 & -1 & -6 & 1 & -3 \\ 0 & 0 & 1 & 0 & 4 \end{pmatrix} \begin{matrix} \\ \\ \\ +6\cdot \mathrm{III} \\ -1\cdot \mathrm{III} \end{matrix}$$

$$B = \begin{pmatrix} 2 & 0 & 4 & 0 & -2 \\ 3 & 1 & -6 & 1 & 3 \\ -1 & 0 & 1 & 0 & -3 \\ 0 & -1 & -6 & 1 & -21 \\ 0 & 0 & 1 & 0 & 7 \end{pmatrix}$$ done!

$$U = \begin{pmatrix} 2 & 0 & 4 & 0 & -2 \\ 0 & 1 & -6 & 1 & 3 \\ 0 & 0 & 1 & 0 & -3 \\ 0 & 0 & 0 & 1 & -21 \\ 0 & 0 & 0 & 0 & 7 \end{pmatrix}$$

$$L = \begin{pmatrix} \underline{1} & 0 & 0 & 0 & 0 \\ \underline{3/2} & 1 & 0 & 0 & 0 \\ \underline{-1/2} & 0 & 1 & 0 & 0 \\ 0 & \underline{-1} & \underline{-6} & 1 & 0 \\ 0 & 0 & \underline{1} & 0 & \underline{1} \end{pmatrix}$$ Use the multipliers from all the steps!

Solve system with $a_j = \begin{pmatrix} 7 \\ -2 \\ 0 \\ 3 \\ 0 \end{pmatrix}$ using forward subst.

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 3/2 & 1 & 0 & 0 & 0 \\ -1/2 & 0 & 1 & 0 & 0 \\ 0 & -1 & -6 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \end{pmatrix} \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \end{pmatrix} = \begin{pmatrix} 7 \\ -2 \\ 0 \\ 3 \\ 0 \end{pmatrix}$$

$$\Rightarrow \begin{pmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \\ y_5 \end{pmatrix} = \begin{pmatrix} 7 \\ -\frac{25}{2} \\ \frac{7}{2} \\ \frac{23}{2} \\ -\frac{7}{2} \end{pmatrix}$$

$$A = \begin{pmatrix} 2 & 4 & 3 & 5 \\ -4 & -7 & -5 & -8 \\ 6 & 8 & 2 & 9 \\ 4 & 9 & -2 & 14 \end{pmatrix} \begin{matrix} \\ -(-2)\cdot \mathrm{I} \\ -3\cdot \mathrm{I} \\ -2\cdot \mathrm{I} \end{matrix}$$

$$A = \begin{pmatrix} 2 & 4 & 3 & 5 \\ 0 & 1 & 1 & 2 \\ 0 & -4 & -7 & -6 \\ 0 & 1 & -8 & 4 \end{pmatrix} \begin{matrix} \\ \\ -(-4)\cdot \mathrm{II} \\ -1\cdot \mathrm{II} \end{matrix}$$

$$A = \begin{pmatrix} 2 & 4 & 3 & 5 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & -3 & 2 \\ 0 & 0 & -9 & 2 \end{pmatrix} \begin{matrix} \\ \\ \\ -3\cdot \mathrm{III} \end{matrix}$$

$$A = \left(\begin{array}{cc|cc} 2 & 4 & 3 & 5 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & -3 & 2 \\ 0 & 0 & 0 & -4 \end{array}\right)$$

$$U = \begin{pmatrix} 2 & 4 & 3 & 5 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & -3 & 2 \\ 0 & 0 & 0 & -4 \end{pmatrix}$$

$$L = \begin{pmatrix} 1 & 0 & 0 & 0 \\ -2 & 1 & 0 & 0 \\ 3 & -4 & 1 & 0 \\ 2 & 1 & 3 & 1 \end{pmatrix}$$

done!

$$LU = A$$