

# Howework 3 – Introduction to Computational Science

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April 19, 2020

## Question 1

to be transcribed

## Question 2

$$\begin{aligned} i = 1 \quad k = 4 \quad p = [4 \ 2 \ 3 \ 1] \\ l_1 = \begin{bmatrix} 1/8 \\ 1/4 \\ 1/2 \\ 1 \end{bmatrix} \quad u_1 = [32 \ 24 \ 10 \ 11] \\ A_2 = \begin{bmatrix} 4 & 3 & 2 & 1 \\ 8 & 8 & 5 & 2 \\ 16 & 12 & 10 & 5 \\ 32 & 24 & 20 & 11 \end{bmatrix} - \begin{bmatrix} 4 & 3 & 5/2 & 11/8 \\ 8 & 6 & 5 & 11/4 \\ 16 & 12 & 10 & 11/2 \\ 32 & 24 & 20 & 11 \end{bmatrix} = \begin{bmatrix} 0 & 0 & -1/2 & -3/8 \\ 0 & 2 & 0 & -3/4 \\ 0 & 0 & 0 & -1/2 \\ 0 & 0 & 0 & 0 \end{bmatrix} \\ i = 2 \quad k = 2 \quad p = [4 \ 2 \ 3 \ 1] \\ l_2 = \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix} \quad u_2 = [0 \ 2 \ 0 \ -3/4] \\ A_3 = \begin{bmatrix} 0 & 0 & -1/2 & -3/8 \\ 0 & 2 & 0 & -3/4 \\ 0 & 0 & 0 & -1/2 \\ 0 & 0 & 0 & 0 \end{bmatrix} - \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 2 & 0 & -3/4 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 & -1/2 & -3/8 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1/2 \\ 0 & 0 & 0 & 0 \end{bmatrix} \\ i = 3 \quad k = 4 \quad p = [4 \ 2 \ 1 \ 3] \\ l_3 = \begin{bmatrix} 1 \\ 0 \\ 0 \\ 0 \end{bmatrix} \quad u_3 = [0 \ 0 \ -1/2 \ -3/8] \\ A_4 = \begin{bmatrix} 0 & 0 & -1/2 & -3/8 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1/2 \\ 0 & 0 & 0 & 0 \end{bmatrix} - \begin{bmatrix} 0 & 0 & -1/2 & -3/8 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1/2 \\ 0 & 0 & 0 & 0 \end{bmatrix} \end{aligned}$$

$$i = 4 \quad k = 4 \quad p = [4 \ 2 \ 1 \ 3]$$

$$l_4 = \begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} \quad u_4 = [0 \ 0 \ 0 \ -1/2]$$

$$P = \begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

$$L = P * \begin{bmatrix} 1/8 & 0 & 1 & 0 \\ 1/4 & 1 & 0 & 0 \\ 1/2 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 1/4 & 1 & 0 & 0 \\ 1/8 & 0 & 1 & 0 \\ 1/2 & 0 & 0 & 1 \end{bmatrix}$$

$$U = \begin{bmatrix} 32 & 24 & 20 & 11 \\ 0 & 2 & 0 & -3/4 \\ 0 & 0 & -1/2 & -3/8 \\ 0 & 0 & 0 & -1/2 \end{bmatrix}$$