MATH 3322 Quiz 2 T1B

March 16, 2022

1.(40 pts) Let

$$\boldsymbol{A} = \begin{bmatrix} 2 & 1 & 1 \\ 4 & 3 & 3 \\ 8 & 7 & 9 \end{bmatrix}$$

Find the LU decomposition with row pivoting of $\boldsymbol{A}$. ($\boldsymbol{PA} = \boldsymbol{LU}$, write $\boldsymbol{P}, \boldsymbol{L}, \boldsymbol{U}$ explicitly)

2.(40 pts) Let

$$\boldsymbol{A} = \begin{bmatrix} 16 & 12 & 4 \\ 12 & 25 & 11 \\ 4 & 11 & 9 \end{bmatrix}$$

Find the Cholesky decomposition of $\boldsymbol{A}$.

3.(20 pts) Suppose $\boldsymbol{A} \in \mathbb{R}^{n \times n}$ is symmetric postive definite, then $\boldsymbol{A}$ has LU decomposition $\boldsymbol{A} = \boldsymbol{LU}$ and Cholesky decomposition $\boldsymbol{A} = \tilde{\boldsymbol{L}}\tilde{\boldsymbol{L}}^{\boldsymbol{T}}$. Determine the relationship between $\boldsymbol{L}$ and $\tilde{\boldsymbol{L}}$.