Quiz 1 for CS2334(01)

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$StudentName$: _____ ID : _____ $Index$: _____

(1) Let $P, Q, R \in R^{3\times 3}$ be defined as

$$P = I + \mathbf{e}_2\mathbf{e}_1^t, \quad Q = I - 2\mathbf{e}_3\mathbf{e}_1^t, \quad R = I + \mathbf{e}_3\mathbf{e}_2^t$$

(a) Express P^{-1}, Q^{-1}, R^{-1} in a matrix form.

(b) Express $P \times Q \times R$ in a matrix form.

(2) Let $A, B \in R^{n\times n}$ be *unit lower* $-\ \Delta$ matrices and let $C = AB$, show that C is also a *unit lower* $-\ \Delta$ matrix.

(3) A linear system of equations is given below.

$$\begin{aligned} 2x &+ y &&= 1 \\ 2x &+ 4y + z &&= -1 \\ -4x &+ y + 5z &&= 0 \end{aligned}$$

(a) Express this system as $A\mathbf{x} = \mathbf{b}$, where $\mathbf{x} = [x, y, z]^t$, show A and $\mathbf{b}$, respectively.

(b) *Find* L and U such that $A = LU$, where L is unit lower-Δ and U is upper-Δ.

(c) Give Matlab commands to input A and $\mathbf{b}$, and solve $A\mathbf{x} = \mathbf{b}$ in this problem.