# ITM426, Long Quiz 2, 2025 Fall

- ITM 426 Engineering Mathematics 2025 F
- Duration: 90 minutes
- Weights: 30%
- 5 Questions

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- Write legibly.
- Justification is necessary unless stated otherwise.
- Partial points are given only sparingly for the most problems because you are expected to 1) carry out proper sanity check and 2) correct your mistake by doing so.

| | |
|---|---|
| 1 | 10 |
| 2 | 10 |
| 3 | 10 |
| 4 | 10 |
| 5 | 10 |
| Total | 50 |

#1. Mark True or False. No justification is necessary. `[Each 2.5pt]`

- If $A\mathbf{x} = \mathbf{0}$ has only the trivial solution and $A\mathbf{x} = \mathbf{b}$ has a solution, then the solution to $A\mathbf{x} = \mathbf{b}$ is unique. (**TRUE** / **FALSE**)
- If one row in an echelon form of an augmented matrix is [0 0 0 5 0], then the associated linear system is inconsistent. (**TRUE** / **FALSE**)
- In some cases, a matrix may be row reduced to more than one matrix in reduced echelon form, using different sequences of row operations. (**TRUE** / **FALSE**)
- Let $A$ be a $3 \times 2$ matrix. The equation $A\mathbf{x} = \mathbf{b}$ cannot be consistent for all $\mathbf{b}$ in $\mathbb{R}^3$. (**TRUE** / **FALSE**)

#2. Find an LU factorization of the following matrix [10pt]

$$A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 0 & 2 \\ 4 & 1 & 8 \end{bmatrix}$$

#3. Find an inverse of the following matrix [10pt]

$$A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 0 & 2 \\ 4 & 1 & 8 \end{bmatrix}$$

#4. Provide the clear definition by completing the the following sentences. (Hint: This question asks for the *definition* and does not assume that $T$ is a linear mapping. Your statement should not even use $A$, which is defined as a standard matrix under the assumption of $T$ being linear mapping.) `[Each 5pts]`

- A mapping $T : \mathbb{R}^n \Rightarrow \mathbb{R}^m$ is said to be **onto** $\mathbb{R}^m$ if ( ).
- A mapping $T : \mathbb{R}^n \Rightarrow \mathbb{R}^m$ is said to be **one-to-one** if ( ).

#5. Consider a linear mapping $T : \mathbb{R}^n \Rightarrow \mathbb{R}^m$. For each case, provide an example of standard matrix $A$.`[Each 2.5pts]`

- $T$ is *onto* but not *one-to-one*
- $T$ is *one-to-one* but not *onto*
- $T$ is not *onto* and not *one-to-one*
- $T$ is *onto* and *one-to-one*

(blank)

Write your name before detaching this page. Your Name: _____