MATH 2101 LINEAR ALGEBRA I, FALL 2025 – ASSIGNMENT 2

Due date: 22 September (Monday), 2025 10:00pm.

- To receive *full credits*, the solution has to be *clear* and provide sufficient explanations.
- All solutions have to be turned in HKU moodle in the format of *PDF file*.
- Please include your *Name, UID, Faculty, Major (if declared)* in your solution.

1. Let A be an invertible 5×5 matrix and let B be an invertible 3×3 matrix. Let C be a 5×3 matrix. Consider the following block matrix:
$$D = \begin{pmatrix} A & C \\ 0_{3\times 5} & B \end{pmatrix}.$$
Determine if D is invertible. If D is invertible, find D^{-1} in terms of A^{-1}, B^{-1}, A, B, C. If D is not always invertible, give an example.
2. Let v be an $n \times 1$ matrix. Suppose $n \geq 2$. Use properties of determinants to prove that $\det(vv^T) = 0$.