Math 4100 Homework 4

Due: 8:00 AM, September 25

(2 pts) Problem 1
If $A$ is a $5 \times 5$ invertible matrix, then what must its column space be? Why?

(2 pts) Problem 2
If the $9 \times 12$ linear system $A\vec{x} = \vec{b}$ is solvable for every $\vec{b}$, then what is the column space of $A$?
(2 pts) Problem 3

(1 pt) Part (a)
Is the subset of \( \mathbb{R}^3 \)
\[ U = \{(b_1, b_2, b_3) : b_1 + b_2 + b_3 = 0\} \]
a subspace of \( \mathbb{R}^3 \)? Explain why or why not.

(1 pt) Part (b)
Is the subset of \( \mathbb{R}^3 \)
\[ U = \{(b_1, b_2, b_3) : b_1 \leq b_2 \leq b_3\} \]
a subspace of \( \mathbb{R}^3 \)? Explain why or why not.
(2 pts) Problem 4

Find the column and null spaces of

\[
\begin{pmatrix}
  2 & 1 & 8 & 5 \\
  1 & 0 & 5 & 2 \\
  1 & 4 & -3 & 6
\end{pmatrix}.
\]