Write legibly and show all work. No partial credit can be given for an unjustified, incorrect answer. Put your name in the top right corner.

1. (Four points) Let $B$ and $C$ be the following two bases of $\mathbb{R}^2$:

   $$B = \left\{ \begin{bmatrix} 3 \\ 5 \end{bmatrix}, \begin{bmatrix} -2 \\ 2 \end{bmatrix} \right\}$$

   and

   $$C = \left\{ \begin{bmatrix} 1 \\ 3 \end{bmatrix}, \begin{bmatrix} 0 \\ -4 \end{bmatrix} \right\}.$$

   Calculate the change of basis matrix $P_{C \leftarrow B}$.

2. (Three points) Suppose that $T$ is a linear transformation from $\mathbb{R}^5$ to $\mathbb{R}^3$ with a two-dimensional kernel. Is $T$ surjective? Explain briefly.

3. (Three points) Suppose $A$ is a $7 \times 10$ matrix. At minimum, how many linearly independent solutions must there be to the equation $A\vec{x} = \vec{0}$? Explain briefly.