1. What are the dimensions of \( \text{null}(A) \) and \( \text{col}(A) \) for \( A = \begin{bmatrix} 1 & 2 \\ 1 & 2 \\ 1 & 2 \end{bmatrix} \) ?

Sketch the kernel and image of associated linear transformation \( T(x) = Ax \).

2. Suppose the homogeneous system \( Ax = 0 \) has 10 equations and 12 variables. What dimensions can the solution space to this system have? If \( \text{null}(A) \) has dimension 2, does \( Ax = b \) have a solution for every \( b \) in \( \mathbb{R}^{10} \)?

3. Do elementary row operations change the row space of a matrix? That is, if \( B = EA \), where \( E \) is an elementary matrix, is \( \text{Row}(B) = \text{Row}(A) \)?

4. Show that \( \dim(\text{Row}(A)) = \dim(\text{Col}(A)) \).