Q2 316

Work 4 of the 6 parts; mark through omitted parts; *no notes, books, or calculators.*

(1) For the given matrices A, consider the associated linear transformation T defined by $T(x) = Ax$ and find $\dim(\text{domain}(T))$, $\dim(\ker(T))$, and $\dim(\text{range}(T))$:

(a) $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$

(b) $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

(c) $A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & 1 \\ 3 & 1 & 3 \end{bmatrix}$

(2) For each of the 3 matrices A (same as in previous problem), find a linearly independent set of vectors spanning $\mathrm{Col}(A)$.

(a) $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$

(b) $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$

(c) $A = \begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & 1 \\ 3 & 1 & 3 \end{bmatrix}$