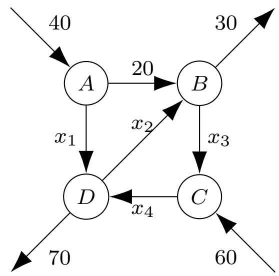
Name: ______________________________

Directions: Show all work. No credit for answers without work.

1. **[2.5 points]** Consider the following network.



Express the general solution to this network flow in parametric form.

2. **[2.5 points]** Determine (with justification) the set of values for h that make $\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3, \mathbf{u}_4, \mathbf{u}_5, \mathbf{u_6}\}$ linearly dependent, where

$$\mathbf{u}_1 = \begin{bmatrix} 2 \\ 1 \\ 8 \\ 5 \\ -1 \end{bmatrix} \quad \mathbf{u}_2 = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \\ h \end{bmatrix} \quad \mathbf{u}_3 = \begin{bmatrix} 7 \\ 3 \\ -1 \\ 2 \\ 6 \end{bmatrix} \quad \mathbf{u}_4 = \begin{bmatrix} 1 \\ -1 \\ 2 \\ 1 \\ 1 \end{bmatrix} \quad \mathbf{u}_5 = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 0 \end{bmatrix} \quad \mathbf{u}_6 = \begin{bmatrix} 3 \\ 0 \\ 2 \\ 1 \\ -1 \end{bmatrix}.$$

3. **[2.5 points]** Determine (with justification) whether the columns of the following matrix are linearly dependent.

$$\begin{bmatrix} 1 & 2 & -1 \\ 2 & -2 & 10 \\ 4 & 1 & 10 \\ -1 & 3 & -9 \end{bmatrix}.$$

4. **[2.5 points]** Is there a linearly dependent set of vectors $\{\mathbf{u}, \mathbf{v}, \mathbf{w}\}$ such that $\{\mathbf{u}, \mathbf{v}\}$, $\{\mathbf{u}, \mathbf{w}\}$, and $\{\mathbf{v}, \mathbf{w}\}$ are all linearly independent? Give an example or explain why not.