Attempt all questions and show all your work. Some or all questions will be marked.

- 1. For each of the following three systems of equations:
 - a Construct the associated augmented matrix and find its reduced row echelon form.
 - b Based on the answers in parts (a), for each system, state how many solutions it has. If a system has infinitely many solutions, write the set of all solutions in parametric form.

2. Find all basic solutions to the following homogeneous system.

3. Use Cramer's rule on the following system of equations to solve for y without solving for x, z, or w.

4. Let $A = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 1 & 4 \\ 5 & 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 2 & 1 \\ 0 & 7 & 2 \\ 1 & -4 & -1 \end{bmatrix}$. Find the determinant of $A^{204}B^{97} - A^{202}B^{98}$.

5. Without expanding along any row or column, use the properties of determinants to find the determinant of the following matrix.

| [1 | 0 | 0 | 0 | 3 |
|----|----|---|---|---|
| 0 | -2 | 0 | 0 | 2 |
| 0 | 0 | 0 | 4 | 0 |
| 0 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 4 |

- 6. Determine whether each of the following sets of vectors are linearly dependent or linearly independent.
 - a $\langle 2,3\rangle, \langle 5,2\rangle, \langle 1,7\rangle$
 - b (2,0,1), (3,2,0), (4,3,1)
 - c $\langle 3,0,3,5\rangle,$ $\langle 4,2,2,4\rangle,$ $\langle 0,-4,-1,2\rangle$

7. Find all values a for which the set $\{\langle a-5, 13, 0 \rangle, \langle -1, a-9, 0 \rangle, \langle 4, 0, a-2 \rangle\}$ is linearly dependent.