

For full credit, you must show all work and circle your final answer.

- 1 (a) Find the solution set to the following system of equations. (Write it in parametric form.)

$$\begin{array}{rrcrcl} x_1 & + & 2x_2 & - & 3x_3 & = & 3 \\ 2x_1 & + & x_2 & - & 3x_3 & = & 3 \\ -x_1 & + & x_2 & & & = & 0 \end{array}$$

- (b) Find the solution set to the following matrix equation. (Hint: Compare to the above.)

$$\begin{bmatrix} 1 & 2 & -3 \\ 2 & 1 & -3 \\ -1 & 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 3 \\ 3 \\ 0 \end{bmatrix}$$

2 Determine which of the following sets of vectors are linearly independent.

$$(a) \left\{ \begin{bmatrix} 1 \\ 2 \\ 5 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 \\ 9 \\ 0 \\ -1 \end{bmatrix} \right\}$$

$$(b) \left\{ \begin{bmatrix} 2 \\ -2 \\ 3 \\ 9 \end{bmatrix}, \begin{bmatrix} 7 \\ 9 \\ 0 \\ -2 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} -3 \\ 7 \\ 2 \\ 5 \end{bmatrix} \right\}$$

3 Determine if \mathbf{b} lies in the span of the given vectors.

$$(a) \mathbf{b} = \begin{bmatrix} 1 \\ 2 \\ 6 \end{bmatrix}; \quad \left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} \right\}$$

$$(b) \mathbf{b} = \begin{bmatrix} 4 \\ 1 \\ -4 \end{bmatrix}; \quad \left\{ \begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix}, \begin{bmatrix} 0 \\ 8 \\ -2 \end{bmatrix}, \begin{bmatrix} 6 \\ 5 \\ 1 \end{bmatrix} \right\}$$