Find the solution set of the system corresponding to
\[
\begin{pmatrix}
0 & 1 & 2 & | & 5 \\
0 & -1 & 3 & | & 25
\end{pmatrix}
\]
in the form
\[
\begin{bmatrix}
x_1 \\
x_2 \\
x_3
\end{bmatrix} = \begin{bmatrix}
\phantom{0} \\
\phantom{0} \\
\phantom{0}
\end{bmatrix} + s \begin{bmatrix}
\phantom{0} \\
\phantom{0} \\
\phantom{0}
\end{bmatrix}
\]

Does the augmented matrix
\[
\begin{pmatrix}
1 & 2 & -1 & | & 3 \\
0 & 1 & 1 & | & 2 \\
1 & 3 & 0 & | & 4
\end{pmatrix}
\]
have zero, one, or infinitely many solutions?

1.3.12 Determine if \( b \) is a linear combination of \( a_1, a_2, \) and \( a_3 \):
\[
a_1 = \begin{bmatrix}
1 \\
0 \\
1
\end{bmatrix}, \quad a_2 = \begin{bmatrix}
-2 \\
3 \\
-2
\end{bmatrix}, \quad a_3 = \begin{bmatrix}
-6 \\
7 \\
5
\end{bmatrix}, \quad b = \begin{bmatrix}
11 \\
-5 \\
9
\end{bmatrix}
\]

1.3.22 Construct a \( 3 \times 3 \) matrix \( A \), with nonzero entries, and a vector \( b \) in \( \mathbb{R}^3 \) such that \( b \) is \textit{not} in the set spanned by the columns of \( A \).

1.4.15 Let \( A = \begin{bmatrix}
3 & -1 \\
-9 & 3
\end{bmatrix} \) and \( b = \begin{bmatrix}
b_1 \\
b_2
\end{bmatrix} \). Show that the equation \( Ax = b \) does not have a solution for all possible \( b \), and describe the set of \( b \) for which \( Ax = b \) does have a solution.

1.4.26 Let \( u = \begin{bmatrix}
7 \\
2 \\
5
\end{bmatrix}, \quad v = \begin{bmatrix}
3 \\
1 \\
3
\end{bmatrix}, \) and \( w = \begin{bmatrix}
5 \\
1 \\
1
\end{bmatrix} \). It can be shown that \( 2u - 3v - w = 0 \). Use this fact (and no row operations) to find \( x_1 \) and \( x_2 \) that satisfy the equation
\[
\begin{bmatrix}
7 & 3 \\
2 & 1 \\
5 & 3
\end{bmatrix} \begin{bmatrix}
x_1 \\
x_2
\end{bmatrix} = \begin{bmatrix}
5 \\
1 \\
1
\end{bmatrix}
\]
1.4.32 Could a set of 3 vectors in \( \mathbb{R}^4 \) span all of \( \mathbb{R}^4 \)? Explain. What about \( n \) vectors in \( \mathbb{R}^m \) where \( n \) is less than \( m \)?

In

\[
A = \begin{bmatrix}
4 & 1 & 5 \\
-5 & 3 & -2 \\
-2 & -1 & -3 \\
1 & 0 & 1
\end{bmatrix}
\]

note that one column is the sum of the other two. Find three different solutions to \( Ax = 0 \). Note that you do not need to use row operations for this problem. See 1.4.26 for inspiration.