Name:

1. Express the following problem as a matrix equation: "Find a linear combination of the vectors $(1,0,1)$ and $(-1,1,1)$ that equals $(1,2,1)$".

2. Draw a diagram that illustrates this problem from the row perspective.

3. Draw a diagram that illustrates this problem from the column perspective.

4. Find a vector $\mathbf{n}$ that is perpendicular to each of the columns of the matrix in the equation you wrote down in Problem 1.

5. Explain why it is true that if the question in Problem 1 has a solution, then $\mathbf{n}$ is perpendicular to $(1,2,1)$. Hint: Show that every linear combination of the columns of the matrix is also perpendicular to $\mathbf{n}$.

6. Now use $\mathbf{n}$ to show that this problem does not have a solution.