Supplementary Problems from the Previous Homework

1. Use Maple to find a basis for the solution space to the system of equations. Make sure that the worksheet which you print out contains all the steps you took to solve this problem.:

$$
\begin{array}{rcrcrcrcrcrcrcl}
-5u & - & 7v & - & 9w & + & 2x & + & 8y & - & 18z & = & 0 \\
-4u & - & 6v & - & 8w & & & + & 2y & - & 8z & = & 0 \\
3u & & & - & 3w & - & 2x & - & 3y & + & 14z & = & 0 \\
5u & - & 4v & - & 13w & + & 2x & + & 15y & + & 2z & = & 0 \\
u & + & v & + & w & - & 2x & - & 6y & + & 10z & = & 0 \\
-2u & + & 4v & + & 10w & + & 7x & + & 15y & - & 32z & = & 0
\end{array}
$$

2. Here are six vectors in $\mathbb{R}^4$. (1, 0, 0, 2), (–1, 4, 5, 3), (1, 4, 5, 7), (2, 6, 7, –1), (3, 2, 2, –4), and (2, –5, 3, 2). If you use Maple for this problem, the please make sure that the worksheet which you print out contains all the steps you took to solve this problem.:
   a. Select a linearly independent subset of these vectors which spans the same space as all six vectors. That is, find a basis for the space spanned by these six vectors.
   b. For each of the other vectors (not in the basis) represent it as a linear combination of the basis vectors.

3. The standard basis for $\mathbb{R}^3$ is {(1, 0, 0), (0, 1, 0), (0, 0, 1)}. Here is another basis for $\mathbb{R}^3$, though certainly not a standard one: {(3, 1, 5), (–2, 4, 1), (0, 2, 7)}. Express each of the standard basis vectors as a linear combination of the "non-standard" basis vectors. For this problem, it is hoped that you will come up with a general, straightforward method that will work regardless of which "non-standard" basis I give you. For example, if you find the solution I'm thinking of, it should take you about 2 minutes to do this problem on Maple.