1) Suppose that $L((1, 2)^T) = (5, 11)^T$ and $L((3, 4)^T) = (11, 25)^T$. Find $L((4, 6)^T)$.

2) Find the transition matrix from $[v_1, v_2, v_3]$ to $[u_1, u_2, u_3]$ where:

$$v_1 = (4, 6, 7)^T, v_2 = (0, 1, 1)^T, v_3 = (0, 1, 2)^T$$

$$u_1 = (1, 1, 1)^T, u_2 = (1, 2, 2)^T, u_3 = (2, 3, 4)^T$$

3) Choose ONE of these to prove (on the back of the page).

   a) If $A$ is similar to $B$ then $A^T$ is similar to $B^T$.
   b) Suppose that $L : V \rightarrow W$ is linear. Prove that Ker $(L)$ is a subspace of $W$.
   c) The dimension of Col$(A)$ equals the dimension of Row$(A)$.

 **Bonus** (about 5 pt): Give an example of a linear transformation which does not have a matrix representation.

**Remarks and Answers:** The average grade was about 50/60. You can use this (unofficial) scale: A’s = 54 to 60, B’s = 48 to 53, C’s = 43 to 38, D’s = 33 to 37.

You can estimate your semester grade using the same scale. Average your best 4 of 5 quiz grades. Compare that number with the scale above. The class average for this number is also about 50/60. This is a bit inflated, because I just dropped a grade and because the scores were fairly high on Q5; the scale will probably come down a little with Q6 and the final. Of course, I will also include your HW and MHW later on.

1) Notice that $(4, 6)^T = (1, 2)^T + (3, 4)^T$ (this made the problem fairly easy - otherwise you’d have to solve a linear system (or compute a transition matrix) to find the right LC). So, $L((4, 6)^T) = L((1, 2)^T) + L((3, 4)^T) = (16, 36)^T$.

2) $$VU^{-1} = \begin{pmatrix} 1 & -1 & 2 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

3) Parts b) and c) are in the text/lectures, but part a) is easiest.

**B)** Any example of $L : V \rightarrow W$ in which $V$ (or $W$) is infinite-dimensional. In that case, the $v \in V$ can’t be represented as column vectors. One example is $d/dx : P \rightarrow P$. 
