Math 341 - Spring 2014 **Final** **Name:** _____
Randall Paul **Part I** **(120 minutes)**

1. For the matrix below, give a basis for the corresponding spaces. (You may use you calculator for row reduction. Otherwise show your work.)

$$A = \begin{bmatrix} -28 & -42 & -38 & 34 \\ -96 & -136 & -124 & 110 \\ 164 & 230 & 210 & -186 \\ 40 & 52 & 48 & -42 \end{bmatrix}$$

(a) $\text{col}(A)$

(b) $\text{null}(A)$

(c) The eigenspace for eigenvalue $\lambda = 2$

2. A car rental company rents cars from two locations in a city: at the airport and downtown. On a typical day 90% of cars rented from the airport are returned at the airport (the remaining 10% downtown). 65% of cars rented from downtown are returned downtown, the rest are returned at the airport.

   (a) Write a difference equations relating the population of cars at the airport on the k-th day (a_k) with the population of cars downtown on the k-th day (d_k) with the corresponding populations on the $k+1$-th day.

   (b) What will be the ratio of cars at the airport to cars downtown after a large number of days?

3. For the circuit diagramed below write down the equations determined by Kirchhoff's laws, then determine the currents in the circuit.