

This exam has 7 problems on 7 pages.

Name: \_\_\_\_\_

Show all work for full credit.

Score: \_\_\_\_\_/100

Put a  around your answer.

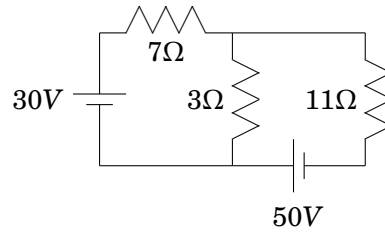
1. (15 pts) Use 3-digit floating point arithmetic without partial pivoting to compute a solution to the following system.

$$\begin{cases} .14x + .37y = 5.12 \\ .91x - 1.31y = -4.4 \end{cases}$$

2. (10 pts) Determine the general solution for the linear system.

$$\begin{cases} 2x + y + z = 4 \\ 4x + 2y + z = 6 \\ 6x + 3y + z = 8 \\ 8x + 4y + z = 10 \end{cases}$$

3. (15 pts) Use Kirchhoff's laws and Ohm's law to set up a system of equations defining the unknown currents in the diagram below. (There are three; choose a labeling yourself.)



4. (15 pts) Given

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 7 & 3 \\ -1 & -3 & -1 \end{bmatrix} \quad \text{and} \quad A^{-1} = \begin{bmatrix} 2 & -3 & -5 \\ -1 & 1 & 1 \\ 1 & 0 & 1 \end{bmatrix},$$

use the Sherman-Morrison formula to compute the inverse of the matrix  $B$  obtained by changing the (2,3) entry of  $A$  from 3 to 2.

5. (20 pts) Compute an LU decomposition for the matrix

$$C = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 7 & 3 \\ -1 & -1 & -3 \end{bmatrix}$$

and use it to compute  $C^{-1}$ . (Note that  $C$  is very similar to  $A$ , but different.)

6. (15 pts) Find nonsingular matrices  $P$  and  $Q$  such that  $PDQ$  is in rank normal form, where

$$D = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 7 \\ 1 & 2 & 3 & 6 \end{bmatrix}.$$

7. (10 pts) Compute the condition number  $\kappa(A)$  for the matrix  $A$  from problem #4, using the  $\infty$ -norm  $\|\cdot\|_\infty$  given by maximum absolute row sum.