

MAT 532 — HOMEWORK 3

DUE ON THURSDAY 20 SEPTEMBER

1. Let $A = \begin{pmatrix} .1 & .2 & .3 \\ .4 & .5 & .6 \\ .7 & .8 & .901 \end{pmatrix}$.

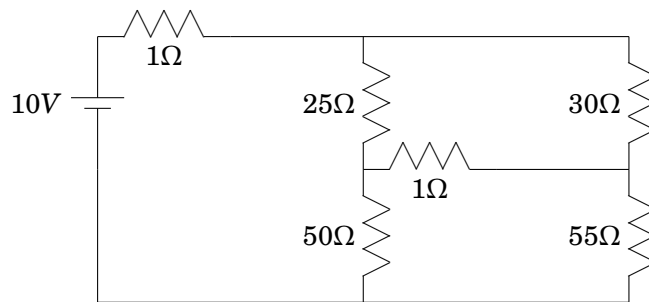
- (a) Use exact arithmetic to compute E_A . In particular, find $\text{rank}(A)$. (You may pretend your calculator does exact arithmetic.)
- (b) Now use 3-digit floating point arithmetic (without partial pivoting or scaling) to compute E_A and $\text{rank}(A)$. Make a guess about the relationship between the two ways of computing rank.

2. Set

$$A = \begin{pmatrix} 1 & 1 & 1 & 2 & 1 \\ 1 & 1 & 0 & 3 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ -1 & 2 & 1 & 3 & 0 \end{pmatrix}.$$

- (a) Compute the reduced row-echelon form of A (by hand, this time).
- (b) Find the general solution to the homogeneous system $Ax = 0$.
- (c) Find the general solution to the non-homogeneous system $Ax = b$, where $b = (8, 1, 1, 3, -3)^T$.

3. 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 **six**; choose a labeling yourself.) **Solve the system.**



4. Consider the three matrices

$$E_1 = \begin{pmatrix} 1 & & \\ & 1 & \\ 3 & & 1 \end{pmatrix} \quad E_2 = \begin{pmatrix} 1 & & \\ & 3 & \\ & & 1 \end{pmatrix} \quad E_3 = \begin{pmatrix} & 1 & \\ 1 & & \\ & & 1 \end{pmatrix}.$$

For each E_i , describe the effect of left-multiplication by E_i on an arbitrary 3×3 matrix A . Ditto for right-multiplication.