

University of Massachusetts Lowell
Department of Electrical and Computer Engineering
16.520 Computer Aided Engineering Analysis
Problem Set 2

1. Using *gess* evaluate $A^{-1}B$ given

$$A = \begin{bmatrix} -2 & 1 & 2 \\ 2 & 3 & -2 \\ 1 & -2 & 3 \end{bmatrix} \quad B = \begin{bmatrix} -2 & 2 & 4 \\ 3 & 1 & -1 \\ 5 & -4 & 6 \end{bmatrix}$$

2. You are given three port resistor network such that the third port is open-circuit.

$$\begin{aligned} V_1 &= R_{11}I_1 + R_{12}I_2 \\ V_2 &= R_{12}I_1 + R_{22}I_2 \\ V_3 &= R_{31}I_1 + R_{32}I_2 \end{aligned}$$

where $\underline{V} = (1, 2, 3)^T$ and $\underline{I} = (1, 2)^T$. Determine the unknown resistances R_{ij} such that square of their magnitude is minimum.

3. The following US Census data is to be modeled by the polynomial

$$P(y) = c_1 + c_2y + c_3y^2$$

where the variable y is the year.

Year	Population
1900	75,994,575
1910	91,972,266
1920	105,710,620
1930	122,775,046
1940	131,669,275
1950	150,697,361
1960	179,323,175
1970	203,235,298
1980	227,224,681
1990	249,438,712
2000	281,421,906

- Scale the year by 1000 and the population by 100,000,000. Calculations should be done double precision.
- Using data from years 1900 to 1980 determine the values of c_n using least-squares. What are the coefficients for the better model based on the square of the error.
- How well does your model match the population given for 1990 and 2000. State the error and plot using *gnuplot* displaying the data as points and the model curve as a solid line.