INSERT YOUR NAME HERE:

Problem 1. Prove that for every $n \times n$ matrix A, rank(A)<n if and only if one of the eigenvalues of A is 0.

Problem 2. Find the Jordan block matrix J similar to $A = \begin{bmatrix} -2 & 0 & 1 & 0 \\ 3 & -1 & 1 & -4 \\ -4 & 0 & 1 & 2 \\ -3 & 0 & 1 & 1 \end{bmatrix}$

Problem 3. For the matrices J and A from problem 2, find P. such that $J=P^{-1}AP$. Verify your answer by multiplication.

Problem 4. Solve (in complex numbers) the equation

$$z^3(\sqrt{3}+i)^3 = (1-i)^6 .$$

Problem 5.Let F be the counterclockwise rotation of the plane $\mathbf{R}^2$ by $\pi/2$ around the origin. Obviously F is a linear mapping. Find its matrix in the basis consisting of the vectors (1,1) and (2,1).