

Problem 1. Find the QR decomposition for the matrix

$$A = \begin{bmatrix} 1 & 1 \\ 2 & -1 \end{bmatrix}, B = \begin{bmatrix} 1 & 1 \\ 2 & 3 \\ 2 & 1 \end{bmatrix}$$

Problem 2. Calculate the area of triangle on the plane \mathbb{R}^2 with vertices $(2, 1), (3, 4), (0, 5)$ using determinants. Also calculate the volume of parallelepiped on \mathbb{R}^3 created by vectors $(2, 1, 1), (3, 4, 1), (0, 5, 1)$.

Problem 3. Consider the following matrix A :

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \end{bmatrix}$$

If there exist λ that makes $\det(A - \lambda I) = 0$? Find all of them. (Those are the eigenvalues of matrix A .)