

Homework set #4, due September 24 10.30 am

1) Let $A = \begin{pmatrix} 1 & 1 & 0 \\ 1 & 2 & 1 \\ 0 & 1 & 3 \end{pmatrix}$

a) Calculate $\det A$

b) Calculate the adjugate matrix of A

c) use this to find A^{-1} and check $A^{-1}A = I$

2) Diagonalize the quadratic form

$$x^2 - 2y^2 + z^2 + 4xy - 6xz + 2yz = 0$$

b) what are the eigenmodes?

3) Do Exercise A.15 of 65.

4) This is a numerical problem. Using Mathematica construct an ensemble

of 1000 100×100 Hermitian random matrices with probability distribution

$$P(H) = e^{-N \text{Tr} H^2} \quad (N=100)$$

a) Make a histogram of the eigenvalues

b) Show that the histogram is fitted by $\sqrt{R^2 - x^2}$. What is R ?

b) What is the area below the curve? Interpret the number.