Homework #3 due September 11

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 $A^{-1}A = 1$

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 GS.

4) This is a numerical problem. Using Mathematica construct an ensemble of 1000 100×100 Hermitian random matrices with probability distribution

$$P(H) = e^{-N \operatorname{Tr} H^2} \qquad (N = 100).$$

a) Make a histogram of the eigenvalues

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

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