72.630 Capacity enhancement methods for radio interface
To be returned before 14.03.2005

Home assignment 4

Exercise 1

The system has 2 transmit antennas and 3 receive antennas. The channel matrix is

$$\mathbf{H} = \begin{bmatrix} 1.07 + 0.59i & -0.41 - 0.14i \\ -1.38 - 0.51i & -0.13 - 0.015i \\ -1.18 - 0.51i & 0.0063 + 0.2i \end{bmatrix}$$

Where the row i stands for the channels to the receiver antenna i. The column j describes that channels from the transmit antenna j.

The system uses Alamouti type mapping and transmits QPSK signals.
Two subsequent received signal values are

$$\mathbf{y} = \begin{bmatrix} 0.88 - 0.089 & -0.77 + 0.63i \\ -1.08 - 0.46 & -0.17 - 1.18i \\ -1.11 - 0.28 & -0.36 - 0.43i \end{bmatrix}$$

Where the row i stands for the signal on the received antenna i and the column describes two subsequent time moments.

Estimate the symbol that is most likely transmitted?
Calculate the probability of the most likely received symbol. The SNR in the channel is 5 dB. Consider also that the signal power per bit at the transmitter is scaled to be 1.
What is the total received signal power? What is the received power per bit?
What is the diversity order of the system?