Hw 4

4.1 We wish to estimate the amplitudes of exponentials in noise. The observed data are

$$x[n] = \sum_{i=1}^{p} A_i r_i^n + w[n] \qquad n = 0, 1, \ldots, N-1$$

where $w[n]$ is WGN with variance σ^2. Find the MVU estimator of the amplitudes and also their covariance. Evaluate your results for the case when $p = 2, r_1 = 1, r_2 = -1$, and N is even.

4.2 Prove that the inverse of $\mathbf{H}^T\mathbf{H}$ exists if and only if the columns of $\mathbf{H}$ are linearly independent. Hint: The problem is equivalent to proving that $\mathbf{H}^T\mathbf{H}$ is positive definite and hence invertible if and only if the columns are linearly independent.