Problems 1

Comments and hints are additional to those given in the book p. 615.

1.1

1.2

1.3   Utilize that the covariance operator is bilinear.

1.4   It is not nescessary to assume that the matrix A is symmetric.

1.5   This is the linear model for one dimensional observations.

Extra   Show that $\sum_i \sum_j a_{ij} \underline{x}_i \underline{x}_j^T = X^T A X$ where A can be chosen symmetric.

Hint : Work out that the arbitrary element $\sum_i \sum_j a_{ij} x_{ir} x_{js}$ is equal to $(x^T A X)_{rs}$.

1.6   Note that the outline solution in the book make use of the following idea :

$$\underline{x}^T A \underline{x} = tr(\underline{x}^T A \underline{x}) = tr(A \underline{x}\,\underline{x}^T),$$

cf. App. 1.1 (b).