

## Problems 3

Comments and hints are additional to those given in the book p. 615 and p. 616.

2.4 a Use indirect proof. It is not necessary to assume  $b \neq 0$ .

b

2.5 a

b Show that  $\forall \underline{z}: \underline{z}^T \underline{e} \sim N(0, \sigma^2 \underline{z}^T (\mathbf{I}_n - P) \underline{z})$

c Note that  $X = [\underline{1}_n \quad \underline{x}^{(1)} \quad \dots \quad \underline{x}^{(k-1)}]$

2.6 Read  $\underline{y}_n$  instead of  $\underline{y}_m$  in the text.

2.7

2.8 a Let  $\bar{y} = A_1 \underline{y}$  and  $y_1 - \bar{y} = A_2 \underline{y}$

Determine  $A_1$  and  $A_2$

Note that  $\text{Cov}(A_1 \underline{y}, A_2 \underline{y}) = \sigma^2 A_1 A_2^T$

b Part result:  $A = \mathbf{I}_n - \frac{1}{n} \underline{1}_n \underline{1}_n^T$

Let  $\underline{u} = \underline{y} - \underline{\theta}$

Show that  $Q = \underline{y}^T A \underline{y} = \underline{u}^T A \underline{u}$