LINEAR MODELS AND DECISIONS

1-9) DO PROBLEMS 5,6,7,8,9,30,37 AND SUPPLEMENTARY PROBLEMS 1,2 IN MENDENHALL, CHAPTER 1

10) FIND $E(U)$ AND $V(U)$ FOR $U = Y_1 - 2Y_2 + Y_3$ WITH

$$E(Y_1) = 1 \quad E(Y_2) = 2 \quad E(Y_3) = -1$$

$$V(Y_1) = 1 \quad V(Y_2) = 3 \quad V(Y_3) = 5$$

$$Cov(Y_1, Y_2) = -4 \quad Cov(Y_1, Y_3) = 1/2 \quad Cov(Y_2, Y_3) = 2$$

11) FIND $E(Y)$ FOR $Y = XB + \tilde{E}$ WITH X, B CONSTANT MATRICES AND $E(\tilde{E}) = 0$

12) SHOW $V(\underline{X}) = E(\underline{X}\underline{X}') - E(\underline{X})\,E(\underline{X})'$

13) FIND $V(\underline{Y})$ FOR $\underline{Y} = A_1\underline{X}_1 + \ldots + A_N\underline{X}_N$, A_i'S CONSTANTS, $\underline{X}_i$'S RANDOM VECTORS

14) FIND $E(\underline{\bar{x}})$ AND $V(\underline{\bar{x}})$ FOR $\underline{\bar{x}} = \frac{1}{N}(\underline{X}_1 + \ldots + \underline{X}_N)$, $E(\underline{X}_i) = \mu$ ALL i, $V(\underline{X}_i) = \sigma^2 I$ ALL i, $Cov(\underline{X}_i, \underline{X}_j) = 0$ FOR $i \neq j$

15) FIND E AND V OF $\underline{Y}, \hat{\underline{Y}}, \hat{\underline{\varepsilon}}, \hat{\underline{\beta}}$ FOR $\hat{\underline{\varepsilon}} = \underline{Y} - \hat{\underline{Y}}$, $\hat{\underline{Y}} = X\hat{\underline{\beta}}$, $\hat{\underline{\beta}} = (X'X)^{-1}X'\underline{Y}$, $\underline{Y} = X\underline{\beta} + \underline{\varepsilon}$ WITH $X, \underline{\beta}$ CONSTANTS AND $E(\underline{\varepsilon}) = \underline{0}$, $V(\underline{\varepsilon}) = \Sigma = \sigma^2 I$