تمارین جلسه 7 ام

۱) الف)

$y \sim N_4(\mu, \Sigma)$ داده شده است μ, Σ

$7y_1 - 2y_2 + 3y_3 - 3y_4$

ابتدا داریم:

$a' = (7, -2, 1, -3)$

$a'y = 4y_1 - 2y_2 + y_3 - 3y_4$

$E[a'y] = a'\mu = \mu_2$ ، $Var(a'y) = a'\Sigma a = \Sigma_2$

$\Rightarrow a'y \sim N(\mu_2, \Sigma_2)$

$a'\mu = (4, -2, 1, 3) \cdot \begin{bmatrix} -2 \\ 3 \\ -1 \end{bmatrix} = -8 - 6 - 1 - 15 = -30$

Subject:
Year. Month. Date.

$$A = \begin{bmatrix} 3 & 1 & -4 & -1 \\ -1 & -3 & 1 & -2 \\ 2 & 2 & 4 & -5 \end{bmatrix}$$

$Ay \sim ?$ $\quad Ay \sim N_k(A\mu, A\Sigma A')$

$E[Ay] = A\mu$, $Cov(Ay) = A\Sigma A'$

$$E[Ay] = \begin{bmatrix} 3 & 1 & -4 & -1 \\ 1 & -3 & 1 & -2 \\ 2 & 2 & 4 & -5 \end{bmatrix} \begin{bmatrix} -2 \\ 3 \\ -1 \\ 5 \end{bmatrix} = \begin{bmatrix} -4 \\ -18 \\ -27 \end{bmatrix}$$

$$Cov(Ay) = \begin{bmatrix} 3 & 1 & -4 & -1 \\ 1 & -3 & 1 & -2 \\ 2 & 2 & 4 & -5 \end{bmatrix} \begin{bmatrix} 11 & -8 & 3 & 9 \\ -8 & 9 & -3 & -6 \\ 3 & -3 & 2 & 3 \\ 9 & -6 & 3 & 9 \end{bmatrix} \begin{bmatrix} 3 & 1 & 2 \\ 1 & -3 & 2 \\ -4 & 1 & 4 \\ -1 & -2 & -5 \end{bmatrix}$$

$$= \begin{bmatrix} 35 & -18 & -6 \\ -18 & 46 & 14 \\ -6 & 14 & 93 \end{bmatrix}$$