WS11/12
Multiv. Analysis

Problem1:
given a normal random vector $\mathbf{X} = (X_1, X_2, X_3)$ with density
$f(x) = C \exp -\frac{1}{2}\left\{x_1\left(x_1 + \frac{1}{2}x_2 + \frac{1}{3}x_3\right) + x_2\left(\frac{1}{2}x_1 + \frac{1}{3}x_2 + \frac{1}{4}x_3\right) + x_3\left(\frac{1}{3}x_1 + \frac{1}{4}x_2 + \frac{1}{5}x_3\right)\right\}$

1. find the covariance matrix of $\mathbf{X}$

2. find the correlation matrix of $\mathbf{X}$

3. find the correlation matrix of $X_1 | (X_2, X_3)$

4. find the regression function of $X_1 | (X_2, X_3)$

5. find the correlation matrix of $(X_1, X_2) | X_3$

6. find the regression function of $(X_1, X_2) | X_3$

problem2:
concentration matrix

$$\begin{bmatrix} \frac{1}{1} & \frac{1}{2} & \frac{1}{3} & \frac{1}{4} & \frac{1}{5} \\ \frac{1}{2} & \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} \\ \frac{1}{3} & \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{7} \\ \frac{1}{4} & \frac{1}{5} & \frac{1}{6} & \frac{1}{7} & \frac{1}{8} \\ \frac{1}{5} & \frac{1}{6} & \frac{1}{7} & \frac{1}{8} & \frac{1}{9} \end{bmatrix}$$

find the conditional correlation matrices

1. $(X_2, X_3, X_4, X_5) | X_1$,

2. $(X_3, X_4, X_5) | (X_1, X_2)$

3. $(X_4, X_5) | (X_1, X_2, X_3)$