(1) Do problem 2.10 on p.56.

(2) Do Problem 2.18 on p.12 on p.59/60.

(3) Review of matrix algebra.

(a) Let
\[A = \begin{pmatrix} 1 & 4 & 1 \\ 3 & 0 & 1 \\ 1 & 0 & 2 \end{pmatrix}, \quad B = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}\]

Compute:
(a1) \( AA' \) (\( A' \) is the transpose of \( A \))
(a2) \( B'B \)
(a3) \( AB \)

(b) Consider the following system of linear equations:

\[
\begin{align*}
2x_1 + 3x_2 + 2x_3 &= -10 \\
-x_1 - 2x_2 + 3x_3 &= 4 \\
3x_1 + 4x_2 + 2x_3 &= -5
\end{align*}
\]

(b1) Write the system in matrix form: \( AX = b \)
(b2) Find \( A^{-1} \). (\( A^{-1} \) is the inverse of \( A \)). You may use SAS to do this.
(b3) Solve the system by the fact \( Ax = b \) (i.e. \( x = A^{-1} b \)). You may use SAS to do this.

(4) (you may use SAS to do b2,b3,b4) Consider the simple linear regression model:

\[Y_i = \beta_0 + \beta_1 x_i + \epsilon_i \text{ where } \epsilon_i \text{ are independent and Normal with mean 0 and variance } \sigma^2\]

(a) Write the model in matrix form \( Y = X \beta + \varepsilon \).

(b) Consider the following data from HW # 1, problem #6:

<table>
<thead>
<tr>
<th>( x_i )</th>
<th>50</th>
<th>64</th>
<th>76</th>
<th>64</th>
<th>74</th>
<th>60</th>
<th>69</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y_i )</td>
<td>128</td>
<td>159</td>
<td>158</td>
<td>119</td>
<td>133</td>
<td>112</td>
<td>96</td>
<td>118</td>
</tr>
</tbody>
</table>

(b1) Write down the matrix \( X \) and the vectors \( Y \) and \( \beta \) for this problem.
(b2) Calculate \( X'X \).
(b3) Calculate \( X'Y \).
(b4) Calculate the least squares estimate $\hat{\beta}$ of the vector $\beta$ by using the result $\hat{\beta} = (X'X)^{-1}X'Y$.

(b5) Check the result of (b4) with your calculation in HW#1 (Problem 6).

(5) Do Problem 3.5 (a,b,c ) on p. 115.

(6) (Optional) Do Problem 2.28 on p.62.

(7) (Optional) Do Problem 2.29 on p.62.