1) Solve the following system using the inverse of the coefficient matrix: (20 points)

\[
\begin{align*}
  x + 2y + z &= 2 \\
  -2x - y + 2z &= 5 \\
  x + 3y - 2z &= -8
\end{align*}
\]

a) Write the above the system as a matrix equation in the form of \( AX = B \).

b) Use the TI – 83/84 to find the inverse matrix: \( A^{-1} \) and write it in the space below, with the entries as fractions.

c) Rewrite the matrix equation in the form of \( X = A^{-1} B \).

d) Again with the help of the TI– 83/84.

\[
\begin{align*}
  x &= _______ \\
  y &= _______ \\
  z &= _______
\end{align*}
\]
2) In a lab experiment, a researcher wants to provide a rabbit with 3,200 units of vitamin A, 5,150 units of vitamin B, and 7,050 units of vitamin C. The rabbit is fed with a mixture of three foods. Each gram of food I contains 2 units of vitamin A, 2 units of vitamin B, and 3 units of vitamin C. Each gram of food II contains 4 units of vitamin A, 7 units of vitamin B, and 9 units of vitamin C. Each gram of food III contains 6 units of vitamin A, 10 units of vitamin B, and 14 units of vitamin C. How many grams of each of food should the rabbit be fed? (25 points)

a) Establish your variables precisely.

b) Write the system of equations.

\[
\begin{align*}
2x + 2y + 3z &= 3200 \\
4x + 7y + 9z &= 5150 \\
6x + 10y + 14z &= 7050
\end{align*}
\]

c) Write the above system as a matrix equation in the form of \( AX = B \).

d) Solve the above matrix equation using the inverse matrix \( A^{-1} \).

\[
x = \underline{\phantom{0}} \quad y = \underline{\phantom{0}} \quad z = \underline{\phantom{0}}
\]
3) A company has three appliance stores that sell washers, dryers and stoves. The following tables give the quantities of these items sold by the three stores in September and October, respectively. (15 points)

<table>
<thead>
<tr>
<th>September Sales</th>
<th>Store 1</th>
<th>Store 2</th>
<th>Store 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washers</td>
<td>30</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>Dryers</td>
<td>20</td>
<td>30</td>
<td>10</td>
</tr>
<tr>
<td>Stoves</td>
<td>10</td>
<td>5</td>
<td>35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>October Sales</th>
<th>Store 1</th>
<th>Store 2</th>
<th>Store 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washers</td>
<td>20</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>Dryers</td>
<td>30</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Stoves</td>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
</tbody>
</table>

a) Create two matrices to represent the above tables.

b) Use the matrices in a) to find the quantities of each item sold by each store in September and October combined.

c) If the price of each washer is $500, the price of each dryer is $400, and the price of each stove is $800, use matrix multiplication to find the total sales in dollars for each store in September. Write the appropriate matrix multiplication problem and its solution below.
4) Maximize the objective function \( P = 100x + 150y \) subject to the following constraints:

\[
\begin{align*}
    & x + 3y \leq 120 \\
    & 35x + 10y \leq 770 \\
    & x \geq 0, \quad y \geq 0
\end{align*}
\]

(20 points)

a) Find the \( x \) and \( y \) – intercepts of each constraint.

\[
\begin{align*}
    & x \text{ - intercept} = \\
    & y \text{ - intercept} = \\
    & x \text{ - intercept} = \\
    & y \text{ - intercept} =
\end{align*}
\]

b) Determine the values that you are using in your \textbf{WINDOW} on the \textbf{TI – 83/84}.

\[
\begin{align*}
    & X_{\text{min}} = \\
    & X_{\text{max}} = \\
    & X_{\text{scl}} = \\
    & Y_{\text{min}} = \\
    & Y_{\text{max}} = \\
    & Y_{\text{scl}} =
\end{align*}
\]

c) Using the \textbf{TI- 83/84}, graph the feasible set and sketch a copy below. Identify the coordinates of the corner points and round the numbers to the nearest tenth. Then determine the maximum value of the objective function by using a table.

Write a complete sentence in which you summarize your solution.
5) Minimize the objective function \( C = 3x + y \) subject to the following constraints:

\[
\begin{align*}
x + y & \geq 5 \\
2x + 3y & \geq 12 \\
4x + y & \geq 8 \\
x & \geq 0 \\
y & \geq 0
\end{align*}
\]

(20 points)

a) Find the \( x \) and \( y \) – intercepts of each constraint.

__________ \hspace{2cm} ____________

__________ \hspace{2cm} ____________

__________ \hspace{2cm} ____________

b) Determine the values that you are using in your \textbf{WINDOW} on the \textbf{TI – 83/84}.

\[
\begin{align*}
X_{\text{min}} &= \\
X_{\text{max}} &= \\
X_{\text{scl}} &= \\
Y_{\text{min}} &= \\
Y_{\text{max}} &= \\
Y_{\text{scl}} &=
\end{align*}
\]

c) Using the \textbf{TI- 83/84}, graph the feasible set and sketch a copy below. Identify the coordinates of the corner points and round the numbers to the nearest tenth. Then determine the minimum value of the objective function by using a table.

Write a complete sentence in which you summarize your solution.