1. A nutritionist wants to create a lunch for a client containing 880 calories and 186g of carbohydrates. The meal is to be created using two foods: Food I and Food II. Determine the number of units of each type of food needed to meet the nutritional requirements of this lunch. The nutritional information for each food is listed in the table below.

<table>
<thead>
<tr>
<th>Food</th>
<th>Calories per unit</th>
<th>Grams of carbohydrate per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>35</td>
<td>4</td>
</tr>
<tr>
<td>II</td>
<td>20</td>
<td>6</td>
</tr>
</tbody>
</table>

a. Clearly define your variables. Set up a system of equations that can be used to solve the problem.

b. Solve the system of equations to determine the number of units of each type of food needed to meet the nutritional requirements of this lunch. Use at least 2 different methods to solve the system of equations.
2. Which augmented matrices are in row-reduced form, where \( a, b, \) and \( c \) are any real numbers?

a. \[
\begin{bmatrix}
1 & 0 & 0 & 3 & a \\
0 & 0 & 1 & 4 & b \\
0 & 1 & 0 & 5 & c
\end{bmatrix}
\]

b. \[
\begin{bmatrix}
1 & 0 & 0 & 3 & a \\
0 & 1 & 0 & 4 & b \\
0 & 0 & 1 & 5 & c
\end{bmatrix}
\]

c. \[
\begin{bmatrix}
1 & 0 & 0 & 3 & a \\
0 & 1 & 0 & 4 & b \\
0 & 0 & 2 & 5 & c
\end{bmatrix}
\]

d. \[
\begin{bmatrix}
1 & 0 & 0 & 3 & a \\
0 & 1 & 1 & 4 & b \\
0 & 0 & 1 & 5 & c
\end{bmatrix}
\]

e. \[
\begin{bmatrix}
1 & 0 & 0 & 3 & a \\
0 & 1 & 0 & 4 & b \\
0 & 0 & 0 & 0 & 0
\end{bmatrix}
\]

f. \[
\begin{bmatrix}
1 & 0 & 0 & 3 & a \\
0 & 0 & 0 & 0 & 0 \\
0 & 1 & 0 & 5 & c
\end{bmatrix}
\]
3. A clown sells balloons and toy ducks. One balloon sells for $0.75 and one toy duck sells for $1.25. If three times as many balloons were sold as toy ducks with a total daily revenue of $84, how many of each were sold.

a. Clearly define your variables. Set up a system of equations that can be used to solve the problem.

b. Solve the system to determine the number of balloons and toy ducks sold.

4. Given the quadratic function $4x^2 - 5x - 2y = 0$.

a. Does the parabola open up or down?

b. What is its vertex?

c. What is the maximum value?

d. What is the minimum value?

e. What is/are the $x$-intercept(s)?

f. What is the $y$-intercept?
5. Grape juice is sold for $4 per gallon and pomegranate juice is sold for $20 per gallon. If a fourth as many gallons of grape juice are needed as gallons of pomegranate juice, how many gallons of each juice should be sold to have $3066 in revenue?

   a. Clearly define your variables. Set up a system of equations that can be used to solve the problem.

   b. Solve the system of equations to determine the number of gallons sold of each type of juice.

6. The matrix

\[
\begin{bmatrix}
1 & 0 & 0 & 1 \\
0 & 2 & 4 & 4 \\
0 & 0 & 1 & 0
\end{bmatrix}
\]

represents a system of equations.

   a. What is the next Gauss-Jordan row operation needed? Give the matrix that would result from performing this Gauss-Jordan row operation.

   b. After performing the Gauss-Jordan row operation needed in part a, what is the next and final Gauss-Jordan row operation?

   c. Give the solution, if it exists, as a point which represents the solution to this system of equations. If the solution does not exist, write “no solution.”
7. Given the following matrix $A$, pivot around the entry $a_{2,2}$.

$$
\begin{bmatrix}
1 & 1 & 1 & 3 \\
0 & -2 & -4 & -4 \\
0 & -2 & 6 & -8
\end{bmatrix}
$$

8. An investor will invest all of $56,000 in stocks. The investor estimated that the high-risk stock will have a rate of return of 18% per year; the medium-risk stocks will have a rate of return of 10% per year, and the low-risk stock will have a rate of return of 4% per year. The investment in the medium-risk stock is to be three times the sum of the investments in the other two stock categories. If the investment goal is to have a return of $5880 per year on the total investment, determine how much the investor should invest in each type of stock. How much did the investor invest in high- and medium-risk stocks? How much return did the investor get on the low- and medium risk stocks?
9. If a company sells an Aggie flag for $50, then 2000 will be demanded by Aggies, and when the price is $60, then 1500 will be demanded by Aggies.

   a. What is the price-demand linear equation?

   b. What is the revenue function?

   c. What is the number of Aggie flags sold that will yield maximum revenue?

   d. What is the maximum revenue?

   e. What is the price of each flag when maximum revenue is achieved?

   f. If the company has fixed cost of $6000 and a variable cost of $32 per flag, what is the company’s linear cost function?

   g. What is the company’s profit function?

   h. How many flags need to be sold to give maximum profit?

   i. What is the maximum profit?

   j. How many Aggie flags should be sold for the company to break even? If needed, round up to nearest whole flag.