1. \(-2x + 3y = 9\)
   \(kx - 2y = -6\)

For what value(s) of \(k\) are there:

(a) exactly one solution?
(b) no solutions?
(c) infinitely many solutions?
2. Given the matrices, \( A = \begin{bmatrix} 0 & 2 \\ -5 & 3 \\ 1 & -2 \end{bmatrix}, \quad B = \begin{bmatrix} -6 & 1 \\ 2 & 4 \\ -3 & 8 \end{bmatrix}, \quad C = \begin{bmatrix} -1 & -3 & 0 \\ 5 & 4 & 1 \end{bmatrix}, \) 
and \( D = \begin{bmatrix} 1 & 0 \\ 3 & -1 \end{bmatrix}, \) find the following:

(a) \(2A + B\)
(b) \(-B - 3A\)
(c) \(A + B + C\)
(d) \(AB\)
(e) \(BA\)
(f) \(DC\)
(g) \(D^2\)
(h) \(AA^T\)
(i) \(a_{12} + 2b_{21} - 3c_{22} + d_{11}\)
3. If \[
\begin{bmatrix}
(a - 4) & 6 \\
-4 & b
\end{bmatrix} - 2 \begin{bmatrix}
0 & 3 \\
-4 & 2
\end{bmatrix} = \begin{bmatrix}
8 & c \\
18 & -5
\end{bmatrix}^T,
\]
determine \(a\), \(b\) and \(c\).
4. Lisa and Susie’s stock holdings are given by matrix $S$.

$$S = \begin{bmatrix}
Lisa & 0 & 100 & 300 & 100 \\
Susie & 400 & 50 & 200 & 100 \\
\end{bmatrix}$$

The matrix $F$ represents the prices per share of each stock at the beginning of trading on Friday and matrix $E$ represents the closing prices per share on Friday, where

$$F = \begin{bmatrix}
A & B & C & D \\
52 & 68 & 42 & 75 \\
\end{bmatrix}$$

and

$$E = \begin{bmatrix}
A & B & C & D \\
75 & 32 & 43 & 66 \\
\end{bmatrix}$$

Using these matrices,

(a) what does $SF^T$ represent?

(b) what does $FE^T$ represent?

(c) find a matrix which represents the amount of money that Lisa and Susie gained or lost in the stock market on Friday.
SET UP the following two problems as a system of equations, and then write the system as a matrix equation.

5. A company makes three different wallpapers, each containing three dyes: maroon, green, and blue. Each roll of wallpaper I uses 3 units of maroon, 2 units of green, and 1 unit of blue. Each roll of wallpaper II uses 5 units of maroon, 4 units of green, and 1 unit of blue. Each roll of wallpaper III uses 1 unit of each color of dye. There are 800 total units of maroon, 600 total units of green, and 300 total units of blue available. If all the dye is used, how much of each wallpaper is made?

6. An investor has $50,000 he invests into three accounts yielding 2%, 8%, and 4% interest/year, respectively. If he earns a total of $4,000 interest in one year, and if he invests twice as much at 4% as he does at 2%, how much does he invest in each account?
7. Which of the following matrices are in row-reduced echelon form?

(a) \[
\begin{bmatrix}
2 & 0 & -1 \\
0 & 1 & 2
\end{bmatrix}
\]

(b) \[
\begin{bmatrix}
0 & 0 & 1 & 5 \\
0 & 1 & 0 & 0 \\
1 & 0 & 0 & 2
\end{bmatrix}
\]

(c) \[
\begin{bmatrix}
0 & 0 & 0 \\
0 & 1 & 1
\end{bmatrix}
\]

(d) \[
\begin{bmatrix}
1 & 0 & 2 & 1 \\
0 & 1 & 0 & 2 \\
0 & 0 & 1 & 3
\end{bmatrix}
\]

(e) \[
\begin{bmatrix}
1 & 1 & 0 \\
0 & 0 & 1
\end{bmatrix}
\]
8. Solve the following system of equations in the following two ways:

(a) using matrix inverses
(b) using Gauss-Jordan elimination

\begin{align*}
x - 2y + z &= 4 \\
y &= x + 2z + 5 \\
4z &= -3y + 10
\end{align*}