Math 229
Systems of Equations and Matrix Practice Problems

1. Solve the following systems of equations using substitution:

   (a) $\begin{cases} 7x + 4y = 29 \\ 2x - y = 4 \end{cases}$

   (b) $\begin{cases} x^2 + y = 100 - 2x \\ 2y - 16x = 50 \end{cases}$

2. Solve the following systems of equations using elimination:

   (a) $\begin{cases} 7x - 8y = 9 \\ 4x + 3y = -10 \end{cases}$

   (b) $\begin{cases} 3x - 2y = 7 \\ 5x + 7y = -5 \end{cases}$

3. Given that:
$$A = \begin{bmatrix} 1 & -5 \\ 3 & 0 \end{bmatrix} B = \begin{bmatrix} 2 & -3 \\ 1 & 7 \end{bmatrix} C = \begin{bmatrix} 1 & 3 & -2 \\ 2 & 0 & 4 \end{bmatrix} D = \begin{bmatrix} 0 & \frac{1}{3} \\ -\frac{1}{5} & \frac{1}{15} \end{bmatrix}$$

   (a) Find $2A - B$

   (b) Find BC

   (c) Prove that $DA = AD$.

4. Let $A = \begin{bmatrix} 2 & 2 \\ -2 & -2 \end{bmatrix}$. Find A^2.

5. Use matrix row reduction to solve: $\begin{cases} 2x + 3y = -1 \\ 6x + 11y = 3 \end{cases}$

6. Use matrix row reduction to solve: $\begin{cases} x + 3y + z = 3 \\ 3x + 8y + 3z = 7 \\ 2x - 3y + z = -10 \end{cases}$

7. Given the matrix: $A = \begin{bmatrix} 11 & 3 \\ 7 & 2 \end{bmatrix}$, find A^{-1}, the inverse of A

8. Use the inverse matrix A^{-1} you found above to solve the system of equations: $\begin{cases} 11x + 3y = -5 \\ 7x + 2y = 1 \end{cases}$

9. Given the matrix: $A = \begin{bmatrix} 4 & 2 & 2 \\ -1 & -3 & 4 \\ 3 & -1 & 6 \end{bmatrix}$, find A^{-1}, the inverse of A

10. Use the inverse matrix A^{-1} you found above to solve the system of equations: $\begin{cases} 4x + 2y + 2z = -3 \\ -x - 3y + 4z = 7 \\ 3x - y + 6z = 2 \end{cases}$