# 1 Assignment 2 - Solving Sets of Equations

1. Solve the following linear system by using *Gauss-Jordan Method*;

$$\begin{aligned} x_1 + 2x_2 + x_3 + 4x_4 &= 13 \\ 2x_1 + 4x_3 + 3x_4 &= 28 \\ 4x_1 + 2x_2 + 2x_3 + x_4 &= 20 \\ -3x_1 + x_2 + 3x_3 + 2x_4 &= 6 \end{aligned}$$

   - What is the solution vector?
   - Which method is better? Why?

   **Hint:** Modify the MATLAB code for *Upper Triangularization Followed by Back Substitution (uptrbk.m).*

2. Modify the MATLAB code for $PA = LU$*:Factorization with Pivoting (lufact.m)* so that $L, U$ and $P$ are output, then by using solve the following linear system;

$$\begin{aligned} x_1 + 2x_2 + 4x_3 + x_4 &= 21 \\ 42x_1 + 8x_2 + 6x_3 + 4x_4 &= 52 \\ 3x_1 + 10x_2 + 8x_3 + 8x_4 &= 79 \\ 4x_1 + 12x_2 + 10x_3 + 6x_4 &= 82 \end{aligned}$$

   - What is the solution vector?
   - Output $L, U$ and $P$ matrices.

   **Hint:** You can check your results by using MATLAB as;

```
>>[L,U,P]=lu(A,b)
>>inv(P)*L*U
```

3. Solve the following linear system by using *Gauss-Seidel Iteration*;

$$\begin{aligned} 4x - y + z &= 7 \\ 4x - 8y + z &= -21 \\ -2x + y + 5z &= 15 \end{aligned}$$

   - Start by $P_0 = (1, 2, 2)$.
   - Tabulate the iterations. Compare with the *Jacobi Iteration.*

   **Hint:** Modify the MATLAB code for *Jacobi Iteration (jacobi.m).*