Math/CS 466/666 **Homework Assignment 02**

Matrix Norms

1. Explain why it is important to use partial or full pivoting when implementing the Gauss-Jordan algorithm on a digital computer.

2. Explain the difference between propagated and generated error.

3. Let

$$A = \begin{bmatrix} -1 & 4 & 2 \\ -2 & 5 & 10 \\ -16 & 16 & -7 \end{bmatrix}$$

Please do all calculations by hand and show your work for full credit.

(i) Find $\|A\|_1$.

(ii) Find $\|A\|_\infty$.

4. Let

$$B = \begin{bmatrix} 0 & 2 \\ 1 & -3 \end{bmatrix}$$

Please do all calculations by hand and show your work for full credit.

(i) Find $\|B\|_F$.

(ii) Find the singular values σ_1 and σ_2 of B.

(iii) Verify that $\|B\|_F = \sqrt{\sigma_1^2 + \sigma_2^2}$.

(iv) Find $\|B\|_2$.

5. Let

$$C = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

Use Matlab or Octave to compute spectral norm of C by entering the commands

```
C=[1,2,3;4,5,6;7,8,9]
norm(C)
```

6. Find a 3×3 matrix that has the singular values $\sigma_1 = 1$, $\sigma_2 = 2$ and $\sigma_3 = 3$. Extra Credit or Math/CS 666: Find a non-diagonal matrix with these singular values.