Assignment 1

Question 1 (30 points)

1) $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ What is $C(A)$? R2

2) $B = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$ What is $C(B)$? R1

3) $D = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 4 \end{bmatrix}$ What is $C(D)$? R2

Question 2 (50 points)

2) Write a program (in any convenient language, like Python/Matlab) that emulates an user localization using GPS. Use the following steps for doing this emulation. Also submit a report with relevant results and explainations.

(a) Fix the user at (100,100,100). Put 5 satellites at any random locations (you can manually put their locations), and fix their positions. Now calculate the time it takes for a signal to arrive from each one of these satellites to the user.

(b) Now lets do the opposite operation, i.e. use the satellite locations and the times to find out the location of the user. Check whether it is coming exactly as (100,100,100).

(c) Now add some random errors with the times (you can use function likes "rand" in matlab). Check how much location inaccuracy it showing up.

(d) Now increase the amount of the random errors with time, and check what is the effect of this change on the localization error. You can plot a graph on the amount of timing errors vs localization error to see the effect. You need to run the program multiple time and then can take the average localization errors).