EECE 7200_Assignment 2

Submitted by Kanimozhi Sathyaseelan

NUID 001733522

1) The files attached are as follows:

myNorm.m

myCircle.m

Hw2_1_Final.m

Figure 1.fig

Figure 2.fig

myNorm.m

In this file I have defined the norm function with two input variables, namely the vector v and the value p with which the norm of the vector v can be calculated using the formula

$$||x||_p = \left(\sum_{i=1}^{n}(|xi|)^p\right)^{(1/p)}, p<\infty, \text{ and } ||x||_\infty = \max_{1<=i<=n}|x_i|$$
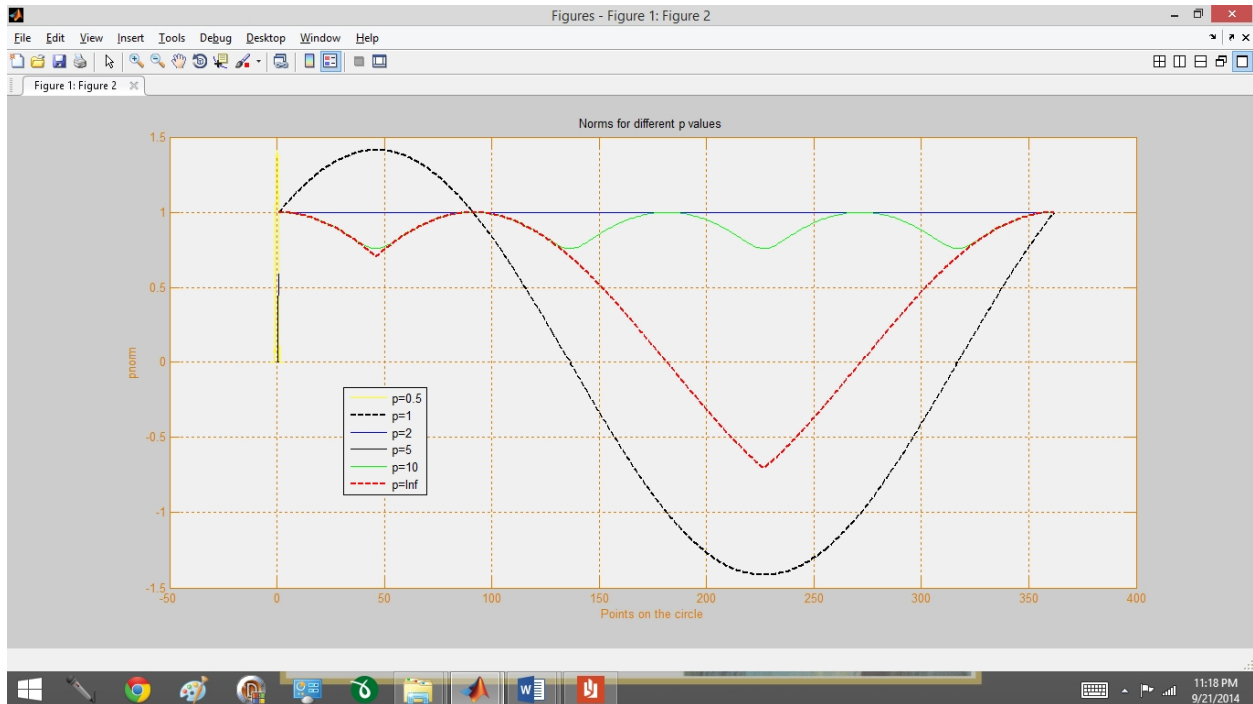
myCircle.m

In this file I have defined a function which takes input values as the radius and the number of points on the circle as the inputs. Here unit circle is mentioned, so taking 1 as radius and 360 points on the circle, I am plotting the unit circle as shown in the figure below.
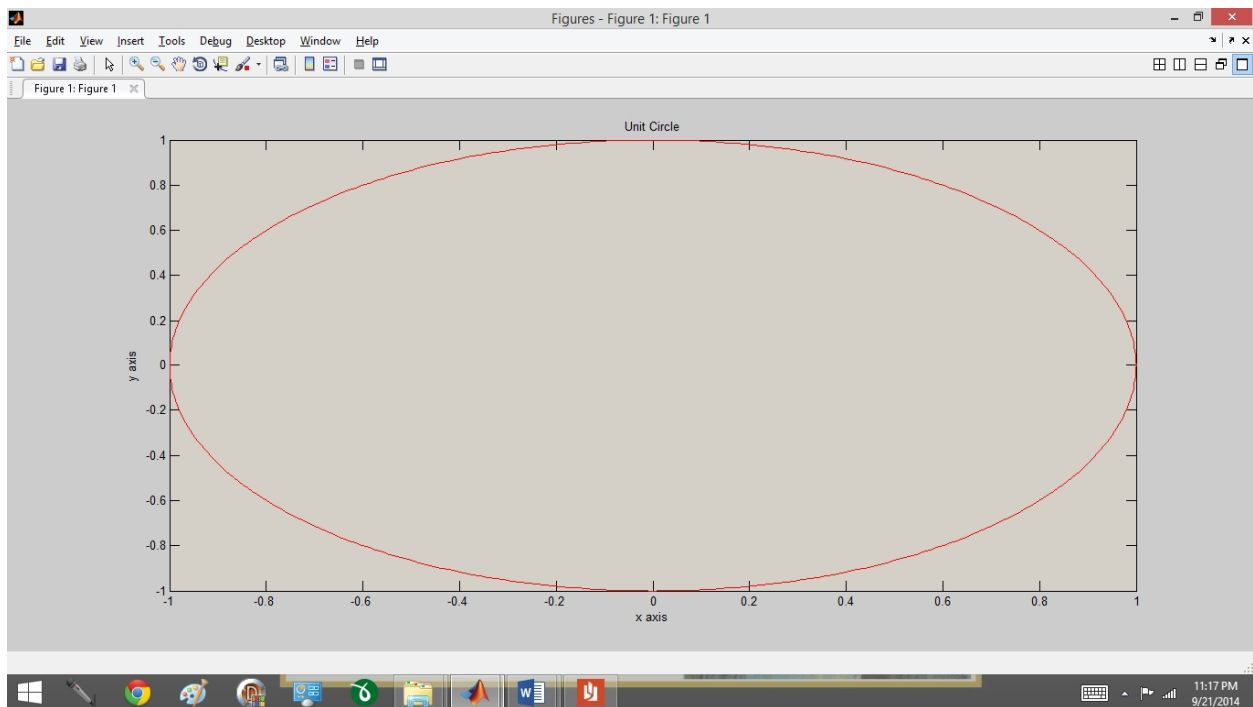
Hw2_1_Final.m

Here I am using the functions myCircle and myNorm which is already defined and hence calculating the norms for different values of p.

The curves of different values of p are plotted and is shown in the figure below.

PS: The m file contains the necessary comments description.

Order of executing files:

myCircle.m

myNorm.m

Hw2_1_Final.m

For p=1 and p=10 the curves are cos and sine waves, valid norms.

2) The files attached are as follows:

Finding_c.m

Figure 3.fig

Finding_c.m

I have taken the c values in the range -1 to +1, as the given value of yn ranges between -1 and 1. The value of increment is 0.01, to get more points between that range selected.

PS: Took 0.1 initially and there were only 21 points to plot for p-norm, so changed it to 0.01

In order to find the c value which gives the min p norm value, the following codes used in the command window to execute the file.

ans = Find (pnorm==min(pnorm)

The answer when applied here ,

-1+0.01*ans

will fetch the required c value.

The following figure shows the plot of the pnorm for different values of p, over the range of c.

  (i)   When p=1, the minimum value of pnorm is found and the index of it is determined, with which the c value is determined as explained above. Thus c=-0.9900
  (ii)   When p=2, the minimum value of pnorm is found and the index of it is determined, with which the c value is determined as explained above. Thus c=0.0200
  (iii)   When p=Inf, c=0

The figure below shows the error norms for different values of p.
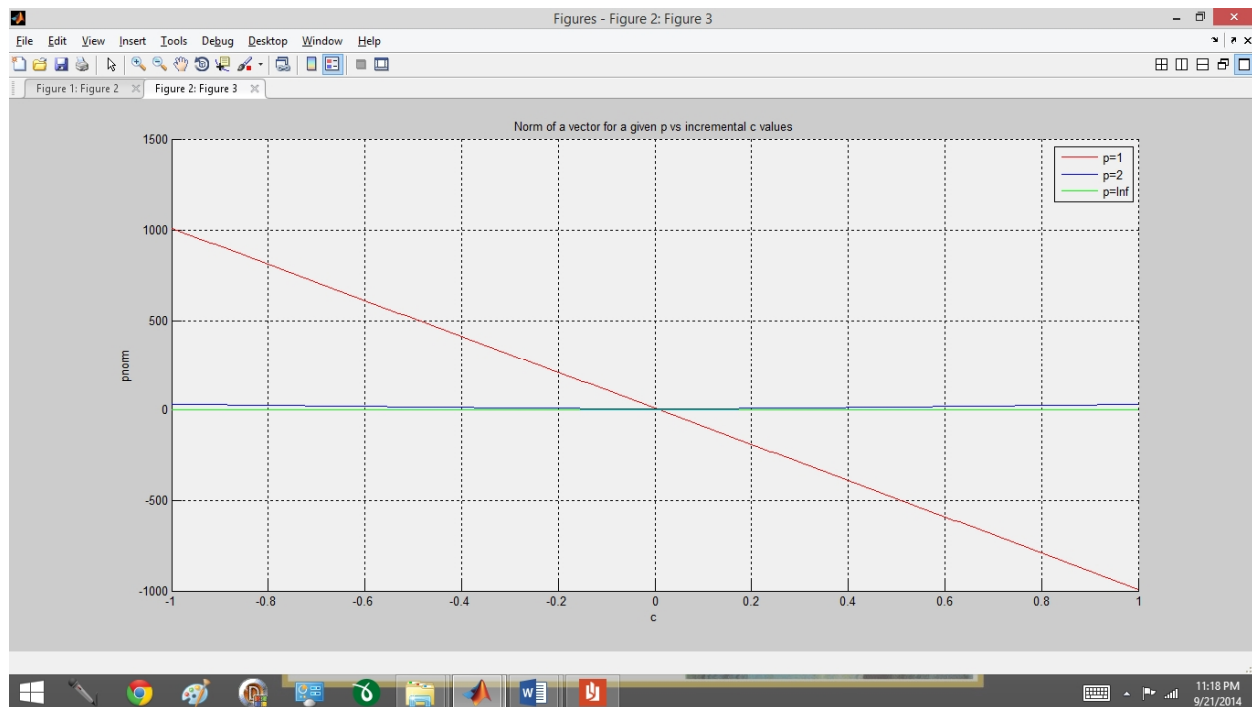
The error norms are filtered from the noise signal yn given.

All the m files and fig files are attached for reference.

3) Solution:
   1. For the sequence, (k, k+1, k+2, ..., K+∞) , the norm tends to ∞ as , k increases
   2. For the sequence, (cos(k), sin(k)), the p2 norm gives a unit circle or a sphere, when k varies from 0 to 2pi
   3. For the sequence (-1/k, -2/k, ...) , the norm tends to 0 as k tends to ∞