Abdullah Gül Üniversitesi
Mühendislik Fakültesi
Group member name(s): Yakup LAÇIN
Group member UID(s): 110510256

Semester 1, 2022
Assignment 1

COMP206: Mathematical Modeling and Algorithmic Thinking

Answer to Question 1

Part a

```
A = rand(100,1)*100;
A = sort(A);

expoonantional = exp(A);
plot(A, expoonantional);
```

Part b

```
A = rand(100,1)*100;
A = sort(A);

logarithmic= log(A);
plot(A, logarithmic);
```

Part c

```
A = rand(100,1)*100;
A = sort(A);

sinus= sin(A);
plot(A, sinus);
```

Part d

```
A = rand(100,1)*100;
A = sort(A);

cosunis= cos(A);
plot(A, cosunis);
```

Answer to Question 2

```
%% Question 2

H = readmatrix ("input.txt");
A = spconvert(H);
D = sum(A,2);
DHalf = diag(sparse(1./sqrt(D)));

identity = eye(10708);

P = identity - (DHalf*A*DHalf);
```

```
%% part a
tic;
[eigenVectors, eigenValues] = eigs(P,2);
toc;

P = full(P);

%% part b

prp = size(P,1);
empty = 1:1:prp;

 scatter(empty, eigenVectors(:,1),'magenta');
    hold on;
  scatter(empty, eigenVectors(:,2),'cyan');

%% part c

 partc = eig(P + (0.6)*identity);

 %% part d

 tic
 [eigenVectorsPowered, eigenValuesPowered] = eig(P^20);
 toc
```

Elapsed time is 8.030583 seconds for part a. Elapsed time is 465.660931 seconds for part d. Q3)

Answer to Question 3

```
%% part a

H = readmatrix ("input.txt");
A = spconvert(H);
D = sum(A,2);
Dhalf = diag(sparse(1./sqrt(D)));

identity = eye(10708);

Q3PRoof = identity - (0.85 * (Dhalf * (A * Dhalf)));

b = zeros(10708,1);

for i = 1:10
    b(i,1) = 1/10;
end

inverseQ3PRoof = inv(Q3PRoof);

tic;
q3PartAX = Q3PRoof\b;
toc;

%% part b
```

```
tic;
q3PartAXEfficient = zeros(10708,1);
for i = 1:10708
    q3PartAXEfficient(i,1) = inverseQ3PRoof(i,:) * b(:,1);
end
toc;
```

Elapsed time is 7.282455 seconds for part a. Elapsed time is 1.641797 seconds for part b.

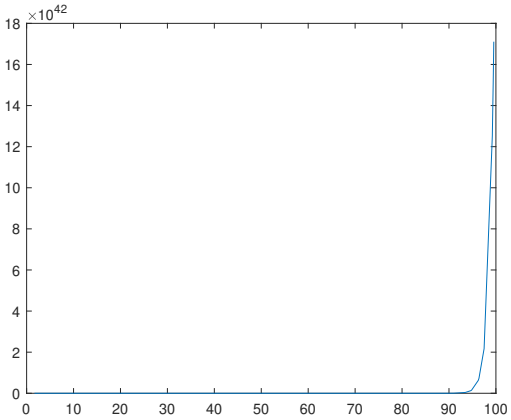

Figure 1: q1 exp

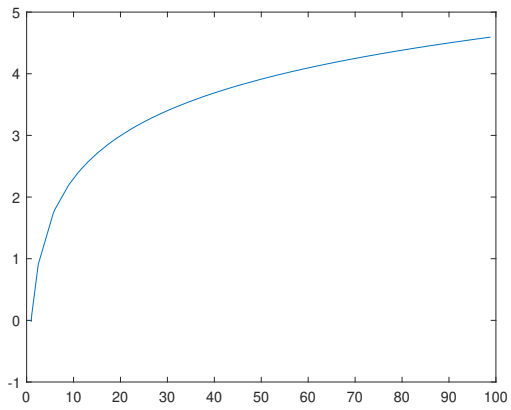

Figure 2: q1 log

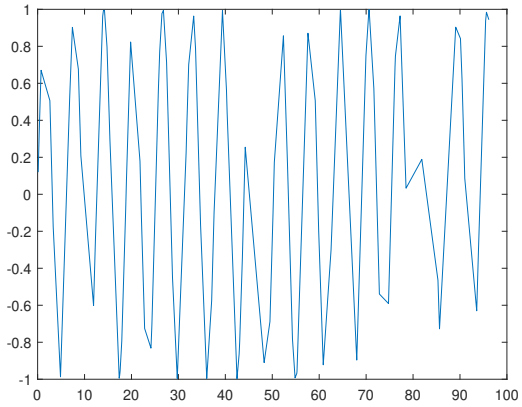

Figure 3: Q1 sinus

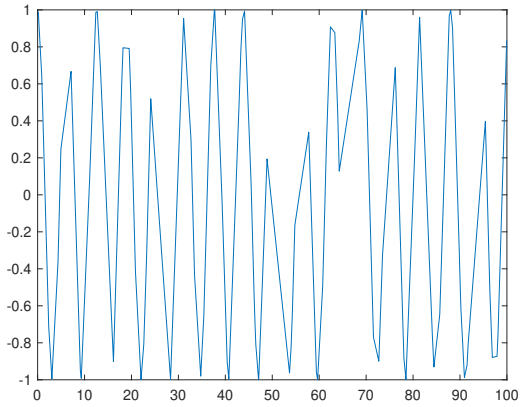

Figure 4: Q1 cosinus

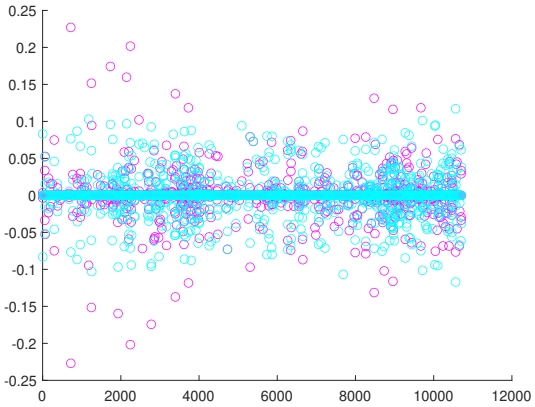

Figure 5: Q2 part b scatter