Contents


```
clc
clear all
```

Numerical Problem 6

```
A = zeros(100,100);


X = size(A,1); %Number of rows
Y = size(A,2); %Number of columns



for i = 1:X
   for j = 1:Y

       if i == j
           A(i,j) = 200;
       elseif i<=50 & j<=50
           A(i,j) = 1;
       elseif i>50 & j>50
           A(i,j) = -1;
       elseif i<=50 & j>50
           A(i,j) = 0;
       elseif i>50 & j<=50
           A(i,j) = 0;
       end

   end
end


b = zeros(X,1);
b(1,1) = 1;

x0 = zeros(X,1);

for i = 1:X
   x0(i,1) = i;
end

x0 = x0/norm(x0);

tol = 0.00001;


del = 1;

k = 1;

x(:,k) = x0;
```

Steepest Decent

```
%Error(1,1) = abs(norm(b-A*x0));

while del > tol

    r = b - A*x(:,k);

    Error(1,k) = norm(r);

    del = norm(r);

    alpha = (r'*r)/(r'*A*r);

    x(:,k+1) = x(:,k) + alpha*r;

    %Error(1,k) = abs(norm(x(:,k+1)-x(:,k)));

    k = k+1;


    kmax = k;


end

for i = 1:kmax-1
   K(1,i) = i;
end





figure(1)
plot(K,Error)
grid on
xlabel('k')
ylabel('error')
title('Steepest decent Error')



x(:,kmax)
```

```
ans =

    0.0050
   -0.0000
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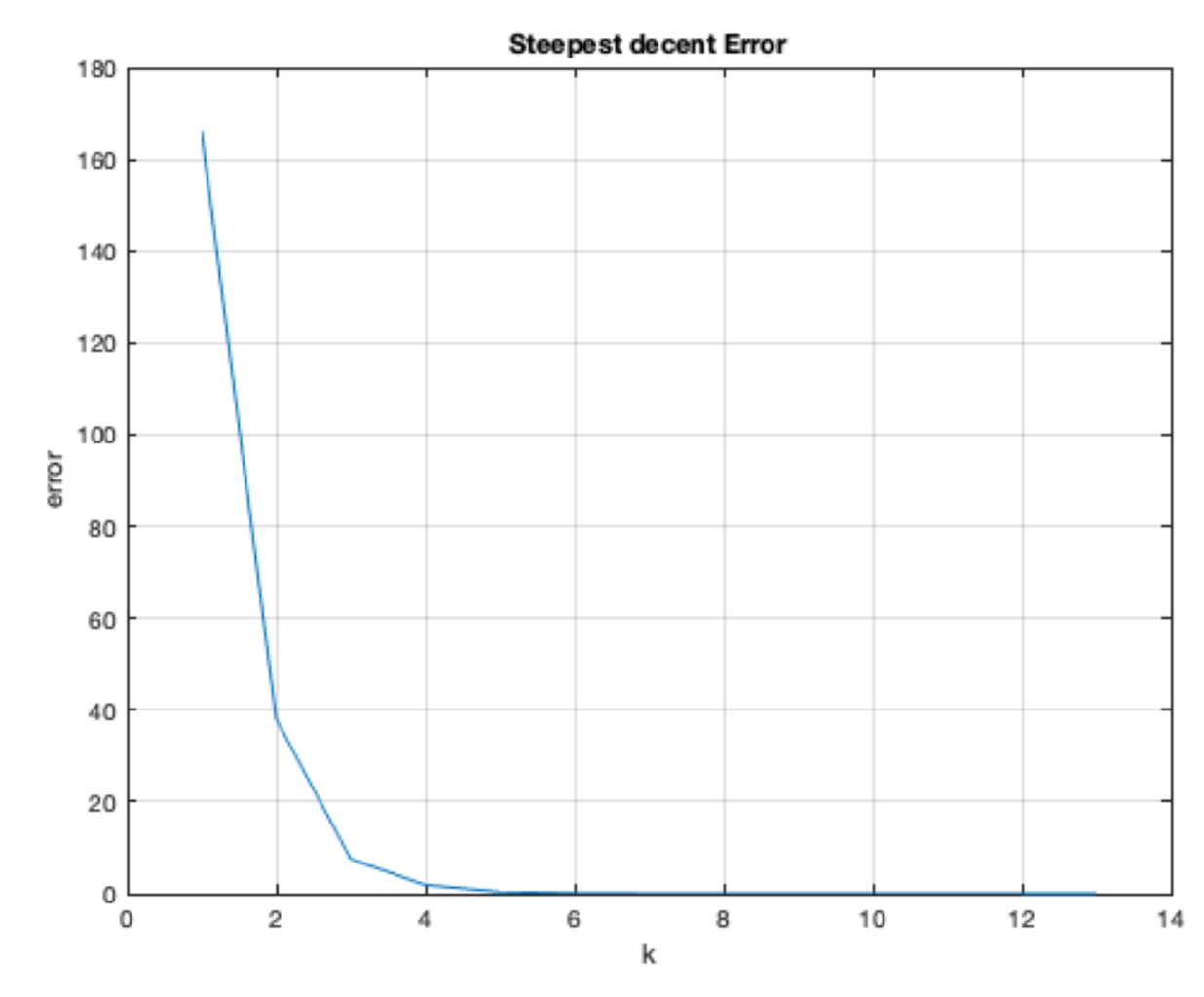

Conugate Gradient

```
r = b - A*x0;
p = r;

k = 1;

x(:,:) = 0;
x(:,k) = x0;

del = 1;

%Error(1,1) = abs(norm(b-A*x0));

while del > tol

   Error(1,k) = norm(r);

   alpha = dot(p,r)/dot(A*p,p);

   x(:,k+1) = x(:,k) + alpha*p;
   r = r-alpha*A*p;

   beta = dot(A*p,r)/dot(A*p,p);

   p = r - beta*p;

   del = norm(r);

   %Error(1,k) = abs(norm(x(:,k+1)-x(:,k)));

   k = k+1;


   kmax = k;


end

figure(2)
plot(K,Error)
grid on
xlabel('k')
ylabel('error')
title('Conjugate Gradient Error')

x(:,kmax)
```

```
ans =

    0.0050
   -0.0000
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