**HW4**

**#1**

function fat=hell(a)

for i=1:size(a,1)

for k=1:i-1

a(i,i)=a(i,i)-a(k,i)^2;

end

if a(i,i)<=0

disp('not positive definite')

return

end

a(i,i)=sqrt(a(i,i));

for j=1+i:size(a,1)

for k=1:i-1

a(i,j)=a(i,j)-a(k,i)\*a(k,j);

end

a(i,j)=a(i,j)/a(i,i);

end

end

disp('positive definite');

fat=a;

for i=2:size(a,1)

for j=1:i-1

fat(i,j)=0;

end

end

a=[9 3 3; 3 10 7; 3 5 9]

hell(a)

b=[4 2 6; 2 2 5; 6 5 29]

hell(b)

c=[4 4 8; 4 -4 1; 8 1 6]

hell(c)

d=[1 1 1; 1 2 2; 1 2 1]

hell(d)

a =

9 3 3

3 10 7

3 5 9

positive definite

ans =

3 1 1

0 3 2

0 0 2

b =

4 2 6

2 2 5

6 5 29

positive definite

ans =

2 1 3

0 1 2

0 0 4

c =

4 4 8

4 -4 1

8 1 6

not positive definite

d =

1 1 1

1 2 2

1 2 1

not positive definite

**#2**

a=[9 3 3; 3 10 7; 3 5 9]

chol(a)

b=[4 2 6; 2 2 5; 6 5 29]

chol(b)

c=[4 4 8; 4 -4 1; 8 1 6]

chol(c)

d=[1 1 1; 1 2 2; 1 2 1]

chol(d)

a =

9 3 3

3 10 7

3 5 9

ans =

3 1 1

0 3 2

0 0 2

b =

4 2 6

2 2 5

6 5 29

ans =

2 1 3

0 1 2

0 0 4

c =

4 4 8

4 -4 1

8 1 6

Error using chol

Matrix must be positive definite.

d =

1 1 1

1 2 2

1 2 1

Error using chol

Matrix must be positive definite.

#**3**

n=4;

a=randn(n)

m=zeros(n,n);

for k=1:n-1

if a(k,k)~= 0

for i=k+1:n

m(i,k)=a(i,k)/a(k,k);

for j=k+1:n

a(i,j)=a(i,j)-m(i,k)\*a(k,j);

end

end

end

end

for i=1:n

m(i,i)=1;

end

for i=2:n

for j=1:i-1

a(i,j)=0;

end

end

m

a

x=m\*a

a =

-0.2612 -0.9480 0.0125 -1.0667

0.4434 -0.7411 -3.0292 0.9337

0.3919 -0.5078 -0.4570 0.3503

-1.2507 -0.3206 1.2424 -0.0290

m =

1.0000 0 0 0

-1.6979 1.0000 0 0

-1.5006 0.8212 1.0000 0

4.7889 -1.7949 -2.0751 1.0000

a =

-0.2612 -0.9480 0.0125 -1.0667

0 -2.3506 -3.0080 -0.8774

0 0 2.0318 -0.5298

0 0 0 2.4050

x =

-0.2612 -0.9480 0.0125 -1.0667

0.4434 -0.7411 -3.0292 0.9337

0.3919 -0.5078 -0.4570 0.3503

-1.2507 -0.3206 1.2424 -0.0290

**#4**

n=3;

ran=randn(n);

problem=transpose(ran)\*ran

a=problem;

%Lu factorization

m=zeros(n,n);

for k=1:n-1

if a(k,k)~= 0

for i=k+1:n

m(i,k)=a(i,k)/a(k,k);

for j=k+1:n

a(i,j)=a(i,j)-m(i,k)\*a(k,j);

end

end

end

end

for i=1:n

m(i,i)=1;

end

a=problem;

%Cholesky

for i=1:size(a,1)

for k=1:i-1

a(i,i)=a(i,i)-a(k,i)^2;

end

if a(i,i)<=0

disp('not positive definite')

return

end

a(i,i)=sqrt(a(i,i));

for j=1+i:size(a,1)

for k=1:i-1

a(i,j)=a(i,j)-a(k,i)\*a(k,j);

end

a(i,j)=a(i,j)/a(i,i);

end

end

for i=2:size(a,1)

for j=1:i-1

a(i,j)=0;

end

end

%Finding S, its diagonal of R

s=zeros(n,n);

for i=1:size(a,1)

s(i,i)=a(i,i);

end

%s=inv(m)\*transpose(a)

a

m

d=s\*s

check=m\*d\*transpose(m)

problem =

5.3431 -7.5310 2.4967

-7.5310 11.0391 -3.8396

2.4967 -3.8396 1.4136

a =

2.3115 -3.2581 1.0801

0 0.6513 -0.4922

0 0 0.0685

m =

1.0000 0 0

-1.4095 1.0000 0

0.4673 -0.7557 1.0000

d =

5.3431 0 0

0 0.4241 0

0 0 0.0047

check =

5.3431 -7.5310 2.4967

-7.5310 11.0391 -3.8396

2.4967 -3.8396 1.4136