Aufgabe 4.19

```
dbtype myCholesky.m

A = [4,-2,0;-2,5,-2;0,-2,3];
R = myCholesky(A);
R2 = chol(A);

disp('A = ');
disp(A);

disp('Linke untere Dreiecksmatrix der eigenen Cholesky-Zerlegung:');
disp(R);

disp('chol Funktion von Matlab:');
disp(R2);
```

```
function C = myCholesky(A)
n = size(A,2);
C = zeros(n,n);

for j=1:n

 for k=1:j-1
  tmp = 0;
  for l=1:k-1
   tmp = tmp + C(j,l) * conj(C(k,l));
  end
  C(j,k) = (A(j,k) - tmp) / C(k,k);
 end

 cj = abs( C(j,:) );
 cj = cj.^2;
 cj_sum = sum(cj(1:j-1));
 C(j,j) = sqrt(A(j,j) - cj_sum );

 end
end
A =
     4    -2     0
    -2     5    -2
     0    -2     3

Linke untere Dreiecksmatrix der eigenen Cholesky-Zerlegung:
    2.0000         0         0
   -1.0000    2.0000         0
         0   -1.0000    1.4142

chol Funktion von Matlab:
    2.0000   -1.0000         0
         0    2.0000   -1.0000
```

```
        0         0    1.4142
```

Aufgabe 4.21

a) A*x = b

```
dbtype JacobiVerfahren.m

n = 10;
alpha = 0.5;
kmax = 100;

A = diag(ones(n-1,1)*alpha,1) + diag(ones(n-1,1)*alpha,-1) +
 diag(ones(n,1));
b = linspace(1,n,n)';
x0 = zeros(n,1);

rel_errors_a = [];
real_x = inv(A)*b;



for k=1:kmax
 x = JacobiVerfahren(A, b, x0, k);
 x_error = norm(real_x - x)/norm(real_x);
 rel_errors_a = [rel_errors_a; x_error];
end


plot(linspace(1,kmax,kmax), rel_errors);
title('alpha = 0.5')
xlabel('Iterationen')
ylabel('Relativer Fehler')

% b)
% neues alpha sonst das gleiche
alpha = 0.25;
A = diag(ones(n-1,1)*alpha,1) + diag(ones(n-1,1)*alpha,-1) +
 diag(ones(n,1));

rel_errors_b = [];

for k=1:kmax
 x = JacobiVerfahren(A, b, x0, k);
 x_error = norm(real_x - x)/norm(real_x);
 rel_errors_b = [rel_errors_b; x_error];
end

T = [rel_errors_a, rel_errors_b];
plot(linspace(1,kmax,kmax), T.','x-');
title('Aufgabe 4.21')
xlabel('Iterationen')
```

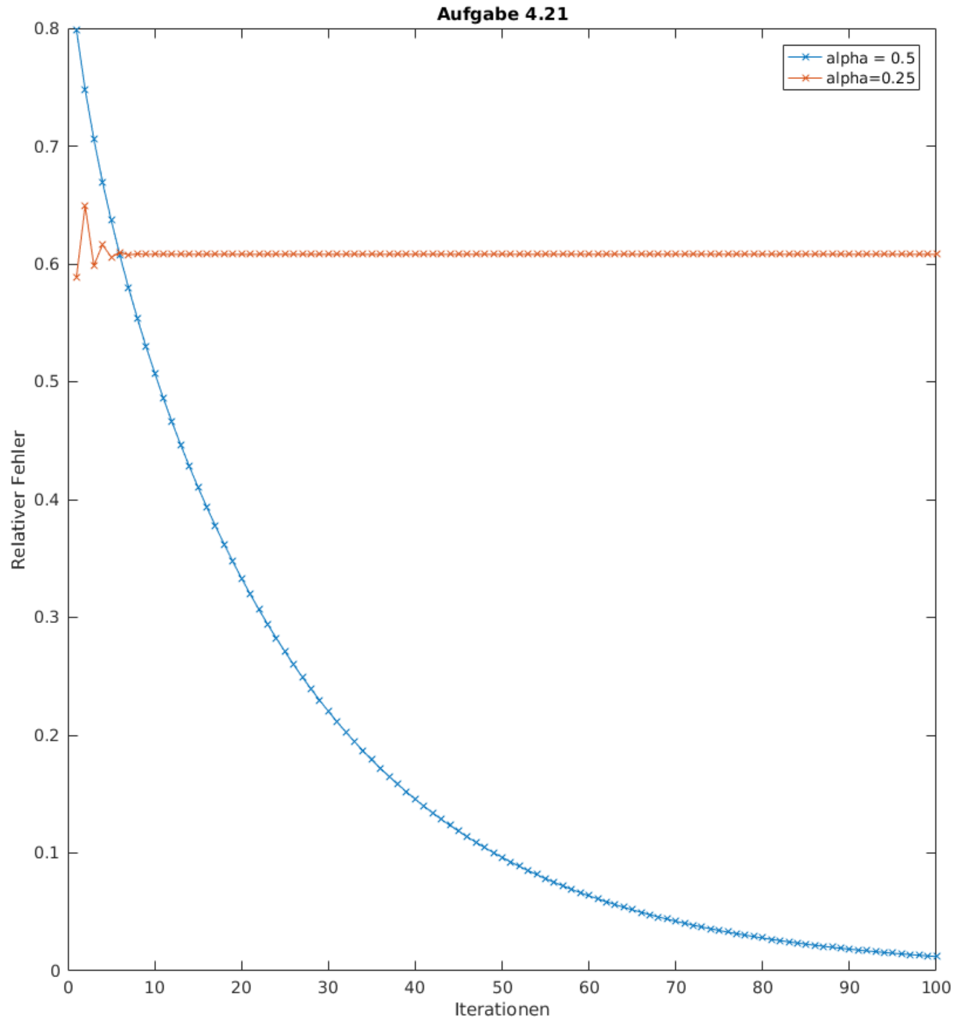
```
ylabel('Relativer Fehler')
legend('alpha = 0.5', 'alpha=0.25')
```

```
function x = JacobiVerfahren(A,b,xs,kmax)
 n = size(A,1);

 xs_tmp = xs;

 for k=[0:kmax]
  for i=1:n
   tmp=0;
   for j=[1:i-1,i+1:n]
    tmp = tmp + A(i,j) * xs(j);
   end
   xs_tmp(i) = (b(i) - tmp)/(A(i,i));
  end

  xs = xs_tmp;
 end
 x = xs_tmp;
end
```



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