Aufgabe 5.25

```
% 1) Gradientenabstieg

dbtype mygrad.m

A = [1,-1;-1,5];
b = [0;0];
e = 10^(-4);
x = [5;3];

result = mygrad(A,b,e,x);

disp(result)

% 2) Konjugierter Gradientenabstieg

dbtype myconjgrad.m

result = mygrad(A,b,e,x);

disp(result)

disp('-> myconjgrad benoetigt weniger Iterationen (2).')

disp('Ausfuehrung blatt5.m')

blatt5


1     function X = mygrad(A, b, e, x)
2     % Implementiertes Gradientenverfahren
3     X = [x];
4
5     k = 0;
6     r = b - A*x;
7
8     while norm(r) > e
9      a = r'*r/(r'*A*r);
10     x = x + a * r;
11     k = k + 1;
12     X = [X,x];
13     r = b - A*x;
14    end
15
16    end
  Columns 1 through 7

    5.0000    4.5517    2.0862    1.8992    0.8705    0.7924    0.3632
    3.0000    0.7586    1.2517    0.3165    0.5223    0.1321    0.2179

  Columns 8 through 14
```

```
    0.3306    0.1515    0.1380    0.0632    0.0576    0.0264    0.0240
    0.0551    0.0909    0.0230    0.0379    0.0096    0.0158    0.0040

  Columns 15 through 21

    0.0110    0.0100    0.0046    0.0042    0.0019    0.0017    0.0008
    0.0066    0.0017    0.0028    0.0007    0.0011    0.0003    0.0005

  Columns 22 through 28

    0.0007    0.0003    0.0003    0.0001    0.0001    0.0001    0.0001
    0.0001    0.0002    0.0001    0.0001    0.0000    0.0000    0.0000
```

```
1     function X = myconjgrad(A,b,e,x)
2     % Implementierung des konjugierten Gradientenverfahrens
3
4     X = [x];
5
6     %Initialisierung
7     r = b - A*x;
8     p = r;
9     z = r'*r;
10    v = A*p;
11    a = z/(p'*v);
12
13    while norm(r) > e
14     v = A * p;
15     a = z/(p'*v);
16     x = x + a*p;
17     r = r - a*v;
18     z_tmp = z;
19     z = r'*r;
20     p = r + (z/z_tmp) * p;
21     X = [X,x];
22    end
23
24    end
```

```
  Columns 1 through 7

    5.0000    4.5517    2.0862    1.8992    0.8705    0.7924    0.3632
    3.0000    0.7586    1.2517    0.3165    0.5223    0.1321    0.2179

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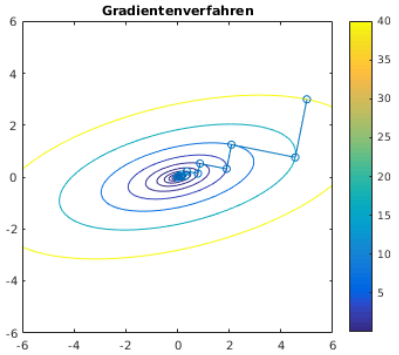
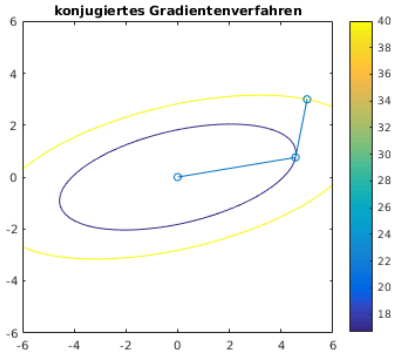
```
  Columns 22 through 28

    0.0007    0.0003    0.0003    0.0001    0.0001    0.0001    0.0001
    0.0001    0.0002    0.0001    0.0001    0.0000    0.0000    0.0000
```

-> myconjgrad benoetigt weniger Iterationen (2).
Ausfuehrung blatt5.m





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