Bogdan Chwaliński
Zestaw 1 zadanie 1.13

Tym razem wykorzystano Eliminacje Gaussa do poszczególnych obliczeń.

Wyniki:

||b1 – b2|| = 0.009999988952358834459173891492370 5

||b3 – b4|| = 0.010000003094494578309158765850944

||z1 – z2||/||b1 – b2|| = 0.001595176672044286136937008354762 5

||z3 – z4||/||b3 – b4|| = 1003.764115386377690697490264093 8

Kod matlaba:

```
function [x] = gaussElim(A,b)

  N = max(size(A));



  for j=2:N,
      for i=j:N,
         m = A(i,j-1)/A(j-1,j-1);
         A(i,:) = A(i,:) - A(j-1,:)*m;
         b(i) = b(i) - m*b(j-1);
      end
  end



  x = zeros(N,1);
  x(N) = b(N)/A(N,N);

  for j=N-1:-1:1,
    x(j) = (b(j)-A(j,j+1:N)*x(j+1:N))/A(j,j);
  end
```

```
>> format longeng
>> helpA = [-116.66654 583.33346 -333.33308 100.00012 100.00012; 583.33346 -116.66654 -333.33308 100.00012 100.00012;
-333.33308 -333.33308 133.33383 200.00025 200.00025; 100.00012 100.00012 200.00025 50.000125 -649.99988; 100.00012
100.00012 200.00025 -649.99988 50.000125]

helpA =

  Columns 1 through 4

   -116.666540000000e+000   583.333460000000e+000  -333.333080000000e+000   100.000120000000e+000
    583.333460000000e+000  -116.666540000000e+000  -333.333080000000e+000   100.000120000000e+000
   -333.333080000000e+000  -333.333080000000e+000   133.333830000000e+000   200.000250000000e+000
    100.000120000000e+000   100.000120000000e+000   200.000250000000e+000    50.000125000000e+000
    100.000120000000e+000   100.000120000000e+000   200.000250000000e+000  -649.999880000000e+000

  Column 5

    100.000120000000e+000
    100.000120000000e+000
    200.000250000000e+000
   -649.999880000000e+000
    50.000125000000e+000

>> A = vpa(helpA,8)

A =
```

```
[ -116.66654,  583.33346, -333.33308,  100.00012,  100.00012]
[  583.33346, -116.66654, -333.33308,  100.00012,  100.00012]
[ -333.33308, -333.33308,  133.33383,  200.00025,  200.00025]
[  100.00012,  100.00012,  200.00025,  50.000125, -649.99988]
[  100.00012,  100.00012,  200.00025, -649.99988,  50.000125]

>> condA = cond(A)

condA =

803011.29021831936854314635198 97

>> format long
>> b1h = [-0.33388066; 1.08033290; -0.98559856; 1.31947922; -0.09473435]

b1h =

  -0.333880660000000
   1.080332900000000
  -0.985598560000000
   1.319479220000000
  -0.094734350000000

>> b1 = vpa(b1h,8)

b1 =

 -0.33388066
   1.0803329
 -0.98559856
   1.3194792
 -0.09473435

>> b2h = [-0.33388066; 1.08033290; -0.98559855; 1.32655028; -0.10180541]

b2h =

  -0.333880660000000
   1.080332900000000
  -0.985598550000000
   1.326550280000000
  -0.101805410000000

>> b2 = vpa(b2h,8)

b2 =

 -0.33388066
   1.0803329
 -0.98559855
   1.3265503
 -0.10180541

>> b3h = [0.72677951; 0.72677951; -0.27849178; 0.96592583; 0.96592583]

b3h =

   0.726779510000000
   0.726779510000000
  -0.278491780000000
   0.965925830000000
   0.965925830000000

>> b3 = vpa(b3h,8)

b3 =

  0.72677951
  0.72677951
 -0.27849178
```

```
  0.96592583
  0.96592583

>> b4h = [0.73031505; 0.73031505; -0.27142071; 0.96946136; 0.96946136]

b4h =

   0.730315050000000
   0.730315050000000
  -0.271420710000000
   0.969461360000000
   0.969461360000000

>> b4 = vpa(b4h,8)

b4 =

  0.73031505
  0.73031505
 -0.27142071
  0.96946136
  0.96946136

>> z1h = gaussElim(A,b1)

z1h =

   0.001982859550270
  -0.000037445535444
  -0.000219649468679
   0.000240550980671
  -0.001779754104899

>> z1 = vpa(z1h,8)

z1 =

    0.0019828596
 -0.000037445535
  -0.00021964947
   0.00024055098
   -0.0017797541

>> z2h = gaussElim(A,b2)

z2h =

   0.001985368955374
  -0.000034936130340
  -0.000214630645971
   0.000253161908275
  -0.001787346205722

>> z2 = vpa(z2h,8)

z2 =

    0.001985369
 -0.00003493613
 -0.00021463065
  0.00025316191
  -0.0017873462

>> z3h = gaussElim(A,b3)

z3h =

   1.0e+02 *

   3.548851813806122
```

```
   3.548851813806122
   7.097681976977409
   3.548834324179575
   3.548834324179575

>> z3 = vpa(z3h,8)

z3 =

 354.88518
 354.88518
  709.7682
 354.88343
 354.88343

>> z4h = gaussElim(A,b4)

z4h =

   1.0e+02 *

   3.584340245589439
   3.584340245589438
   7.168658840543917
   3.584322755297525
   3.584322755297525

>> z4 = vpa(z4h,8)

z4 =

 358.43402
 358.43402
 716.86588
 358.43228
 358.43228

>> b1odejmijb2 = b1 - b2

b1odejmijb2 =

                                  0
                                  0
 -0.00000001000000005024759275329415686 4285
       -0.007071059999999906864331933320 5
      0.007071060000000004008846588021697 2

>> norm(b1odejmijb2)

ans =

0.009999988952358834459173891492370 5

>> b3odejmijb4 = b3 - b4

b3odejmijb4 =

 -0.003535540000000003679758719954406 8
 -0.003535540000000003679758719954406 8
 -0.007071070000000012623075917872483 8
  -0.00353553000000006445446842917590 4
  -0.00353553000000006445446842917590 4

>> norm(b3odejmijb4)

ans =

0.010000003094494578309158765850944

>> z1odejmijz2 = z1 - z2
```

```
z1odejmijz2 =

 -0.000002509405104079986958964809673489 1
 -0.000002509405104080122484236370361543 3
 -0.000005018822708160249231046368123543 3
  -0.000012610927603922712910908265904197
   0.000007592100823198373246714076856278 6

>> norm(z1odejmijz2)

ans =

0.000015951749097503392982496662159642

>> z3odejmijz4 = z3 - z4

z3odejmijz4 =

 -3.548843178331708259065635502338 4
 -3.548843178331651415646774694323 5
 -7.097686356650797279144171625375 7
 -3.548843111795008553599473088979 7
 -3.548843111795008553599473088979 7

>> norm(z3odejmijz4)

ans =

10.037644260006389871409516682 8

>> z1z2b1b2 = norm(z1odejmijz2)/norm(b1odejmijb2)

z1z2b1b2 =

0.001595176672044286136937008354762 5

>> z3z4b3b4 = norm(z3odejmijz4)/norm(b3odejmijb4)

z3z4b3b4 =

1003.764115386377690697490264093 8

>>
```