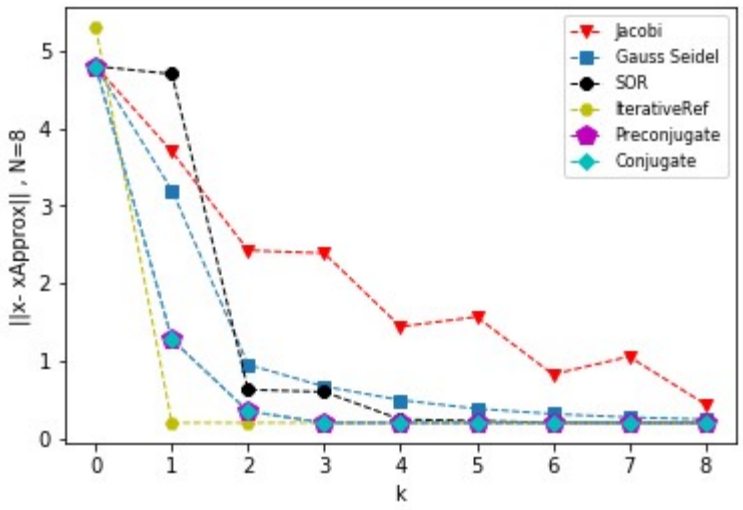
```
In [93]: runfile('C:/Users/Lion/Desktop/Python Files/
Project2iterativeMethodsMatrix/matrixIterativeMethods/testMethod.py', wdir='C:/
Users/Lion/Desktop/Python Files/Project2iterativeMethodsMatrix/
matrixIterativeMethods')
Reloaded modules: na, naTwo, naThree, naFour, naFive, naSix, naSeven, naEight,
naNine
0.0
--Iterations---
Gaussian Elimination BackWard Substituion :
  [[ 3.]
 [ 4.]
 [-5.]]

Partial Pivoting
  [[ 3.]
 [ 4.]
 [-5.]]

Scaled Partial
 [[ 3.]
 [ 4.]
 [-5.]]

Jacobi Method:

[0.    6.    0.375 4.875 1.359 4.172 1.975 3.732 2.359 3.458]
[0.    7.5   1.5   6.188 2.438 5.367 3.023 4.854 3.39  4.534]
[ 0.    -6.    -4.125 -5.625 -4.453 -5.391 -4.658 -5.244 -4.786 -5.153]

 Gauss-Seidels Iterative Method:

[0.    6.    3.75  3.469 3.293 3.183 3.114 3.072 3.045 3.028]
[0.    3.    3.375 3.609 3.756 3.847 3.905 3.94  3.963 3.977]
[ 0.    -5.25  -5.156 -5.098 -5.061 -5.038 -5.024 -5.015 -5.009 -5.006]

 Successive Over Relaxtion

[0.    7.5   3.428 3.399 3.044 3.026 3.002 3.001 3.    3.   ]
[0.    2.344 3.461 3.847 3.961 3.991 3.998 4.    4.    4.   ]
[ 0.    -6.768 -4.727 -5.116 -4.983 -5.007 -4.999 -5.    -5.    -5.   ]

 Iterative Refinement

[0.5 3.  3.  3.  3.  3.  3.  3.  3. ]
[0.5 4.  4.  4.  4.  4.  4.  4.  4. ]
[ 0.5 -5.  -5.  -5.  -5.  -5.  -5.  -5.  -5. ]

 Preconditioned Conjugate Gradient Method

[0.    0.881 1.587 2.107 2.486 2.761 2.961 3.105 3.21 ]
[0.    1.102 1.983 2.634 3.111 3.463 3.725 3.922 4.074]
[ 0.    -0.881 -1.587 -2.107 -2.499 -2.803 -3.048 -3.254 -3.435]

  Conjugate Gradient Method

[0.    3.526 2.858 3.    3.    3.    3.    3.    3.   ]
[0.    4.407 4.149 4.    4.    4.    4.    4.    4.   ]
```

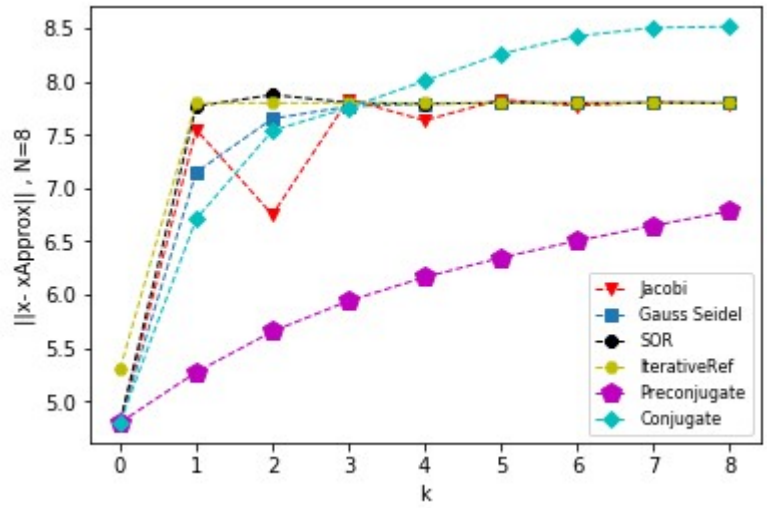
```
[ 0.    -3.526 -4.954 -5.    -5.    -5.    -5.    -5.    -5.   ]

 ----Points on Graph------ x-x*


Jacobi

[4.8        3.7        2.425      2.3875     1.440625   1.5671875
 0.82539062 1.05449219 0.44086914]

Gauss Seidel

[4.8        3.2        0.95       0.66875    0.49296875 0.38310547
 0.31444092 0.27152557 0.24470348]

SOR

[4.8        4.7        0.62773438 0.59866638 0.24423749 0.22591992
 0.20214896 0.20126378 0.20000305]

Iterative Refinement

[5.3 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2]

Preconditoned conjugate Gradient Method

[4.8     1.27423 0.34897 0.2     0.2     0.2     0.2     0.2     0.2    ]
Conjugate Gradient Method
[4.8        1.2742268  0.34897194 0.2        0.2        0.2
 0.2        0.2        0.2       ]
```




```
In [94]: runfile('C:/Users/Lion/Desktop/Python Files/
Project2InterativeMethodExample2/matrixIterativeMethods/testMethod.py', wdir='C:/
Users/Lion/Desktop/Python Files/Project2InterativeMethodExample2/
matrixIterativeMethods')
Reloaded modules: na, naTwo, naThree, naFour, naFive, naSix, naSeven, naEight,
naNine
0.0
--Iterations---
Gaussian Elimination BackWard Substituion :
```

```
  [[ 1.]
 [-1.]
 [ 3.]]

Partial Pivoting
  [[ 1.]
 [-1.]
 [ 3.]]

Scaled Partial
 [[ 1.]
 [-1.]
 [ 3.]]

Jacobi Method:

[0.    2.    1.462 1.188 1.05  1.019 1.003 1.002 1.    1.   ]
[ 0.     0.6   -1.3   -0.765 -1.089 -0.954 -1.02  -0.99  -1.004 -0.998]
[0.    2.75  1.95  3.034 2.836 3.032 2.972 3.009 2.995 3.002]

 Gauss-Seidels Iterative Method:

[0.    2.    1.362 1.066 1.016 1.003 1.001 1.    1.    1.   ]
[ 0.    -0.2   -0.885 -0.967 -0.993 -0.998 -1.    -1.    -1.    -1.   ]
[0.    2.35  2.852 2.967 2.993 2.998 3.    3.    3.    3.   ]

 Successive Over Relaxtion

[0.    2.5   0.791 1.027 0.976 1.015 0.992 1.004 0.998 1.001]
[ 0.    -0.5   -1.005 -1.05  -0.978 -1.009 -0.995 -1.002 -0.999 -1.001]
[0.    2.969 3.076 3.004 2.992 3.003 2.999 3.001 3.    3.   ]

 Iterative Refinement

[0.5 1.  1.  1.  1.  1.  1.  1.  1. ]
[ 0.5 -1.  -1.  -1.  -1.  -1.  -1.  -1.  -1. ]
[0.5 3.  3.  3.  3.  3.  3.  3.  3. ]

 Preconditioned Conjugate Gradient Method

[0.    0.344 0.622 0.831 0.993 1.128 1.245 1.352 1.453]
[0.    0.129 0.229 0.301 0.347 0.37  0.376 0.365 0.339]
[0.    0.473 0.855 1.142 1.365 1.548 1.706 1.849 1.984]

  Conjugate Gradient Method

[0.    1.389 2.09  1.687 0.983 0.405 0.116 0.026 0.062]
[ 0.     0.521 -0.915 -1.666 -1.903 -1.752 -1.458 -1.152 -0.851]
[0.    1.91  2.74  2.956 3.206 3.46  3.626 3.706 3.717]

 ----Points on Graph------ x-x*


Jacobi

[4.8        7.55       6.75       7.834375   7.635625   7.83183594
 7.77242969 7.80928271 7.79472393]

Gauss Seidel
```

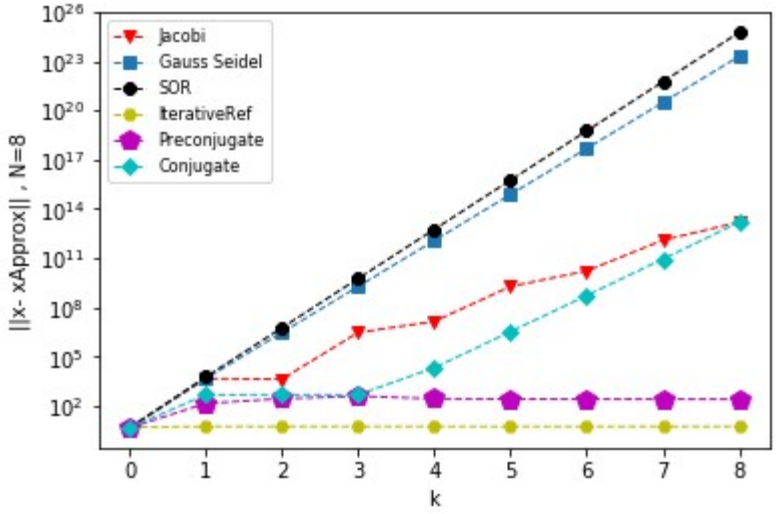
```
[4.8        7.15       7.651875   7.76708594 7.79259404 7.79834398
 7.79962855 7.79991681 7.79998135]

SOR

[4.8        7.76875    7.87617187 7.8039978  7.79238682 7.80302953
 7.79871123 7.80065636 7.79965986]

Iterative Refinement

[5.3 7.8 7.8 7.8 7.8 7.8 7.8 7.8 7.8]

Preconditoned conjugate Gradient Method

[4.8        5.27318711 5.65507636 5.94204889 6.16510813 6.34788737
 6.50604969 6.64942127 6.78391198]
Conjugate Gradient Method
[4.8        6.71047449 7.53956048 7.7557896  8.00637356 8.26026621
 8.42622897 8.50636057 8.51658017]
```




```
In [95]: runfile('C:/Users/Lion/Desktop/Python Files/
Project2IterativeMethodExample3/matrixIterativeMethods/testMethod.py', wdir='C:/
Users/Lion/Desktop/Python Files/Project2IterativeMethodExample3/
matrixIterativeMethods')
Reloaded modules: na, naTwo, naThree, naFour, naFive, naSix, naSeven, naEight,
naNine
0.0
--Iterations---
Gaussian Elimination BackWard Substituion :
  [[1.]
 [1.]
 [1.]]

Partial Pivoting
  [[1.]
 [1.]
 [1.]]

Scaled Partial
```

```
 [[0.99977682]
 [1.00011623]
 [0.99984953]]

Jacobi Method:

[ 0.00000000e+00  4.77437700e+03 -3.36929500e+03  3.02907883e+06
 -1.42801367e+07  1.92914410e+09 -1.67600574e+10  1.25949119e+12
 -1.55342636e+13  8.41210206e+14]
[ 0.00000000e+00  1.70800000e+00 -6.36037000e+02  2.99397700e+03
 -4.05710486e+05  3.51827020e+06 -2.64853124e+08  3.26284797e+09
 -1.76878968e+11  2.74256330e+12]
[ 0.00000000e+00  5.00000000e+00 -4.42303700e+03  5.08090000e+03
 -2.81521044e+06  1.44754006e+07 -1.79789242e+09  1.63397973e+10
 -1.17676852e+12  1.49339027e+13]

 Gauss-Seidels Iterative Method:

[0.00000000e+00 4.77437700e+03 3.02139100e+06 1.90737452e+09
 1.20408686e+12 7.60115544e+14 4.79845481e+17 3.02916691e+20
 1.91225145e+23 1.20716544e+26]
[ 0.00000000e+00 -6.33161000e+02 -4.00343646e+05 -2.52729477e+08
 -1.59542979e+11 -1.00716237e+14 -6.35801117e+16 -4.01368312e+19
 -2.53375651e+22 -1.59950894e+25]
[ 0.00000000e+00 -2.47190300e+03 -1.56851726e+06 -9.90203606e+08
 -6.25095515e+11 -3.94610084e+14 -2.49109319e+17 -1.57257646e+20
 -9.92735527e+22 -6.26693744e+25]

 Successive Over Relaxtion

[0.00000000e+00 5.96797200e+03 5.90244001e+06 5.82950747e+09
 5.75743365e+12 5.68625071e+15 5.61594785e+18 5.54651419e+21
 5.47793898e+24 5.41021162e+27]
[ 0.00000000e+00 -9.89848000e+02 -9.78610943e+05 -9.66512788e+08
 -9.54563155e+11 -9.42761263e+14 -9.31105285e+17 -9.19593417e+20
 -9.08223879e+23 -8.96994909e+26]
[ 0.00000000e+00 -3.10174800e+03 -3.07450253e+06 -3.03653980e+09
 -2.99899730e+12 -2.96191872e+15 -2.92529857e+18 -2.88913118e+21
 -2.85341095e+24 -2.81813235e+27]

 Iterative Refinement

[0.5 1.  1.  1.  1.  1.  1.  1.  1. ]
[0.5 1.  1.  1.  1.  1.  1.  1.  1. ]
[0.5 1.  1.  1.  1.  1.  1.  1.  1. ]

 Preconditioned Conjugate Gradient Method

[  0.    149.719 287.725 406.748 286.874 274.951 271.913 270.517 269.853]
[0.    0.269 0.47  0.602 0.733 0.807 0.855 0.887 0.91 ]
[0.    0.079 0.169 0.261 1.797 2.358 2.705 2.933 3.089]

  Conjugate Gradient Method

[ 0.00000000e+00  4.99014000e+02  4.98909000e+02  4.98553000e+02
  4.60306000e+02 -5.45699400e+03 -9.53592499e+05 -1.58051413e+08
 -2.71069517e+10]
[0.00000000e+00 8.95000000e-01 1.89100000e+00 1.46102000e+02
 2.18263270e+04 3.38500280e+06 5.42279814e+08 8.98324804e+10
```

```
 1.54068668e+13]
[0.00000000e+00 2.64000000e-01 9.68000000e-01 1.02868000e+02
 1.54220790e+04 2.39183717e+06 3.83174044e+08 6.34754862e+10
 1.08864673e+13]

 ----Points on Graph------ x-x*


Jacobi

[4.80000000e+00 4.77157744e+03 4.41823712e+03 3.02907603e+06
 1.42801395e+07 1.92914409e+09 1.67600574e+10 1.25949119e+12
 1.55342636e+13]

Gauss Seidel

[4.80000000e+00 4.77157744e+03 3.02138820e+06 1.90737452e+09
 1.20408686e+12 7.60115544e+14 4.79845481e+17 3.02916691e+20
 1.91225145e+23]

SOR

[4.80000000e+00 5.96517180e+03 5.90243721e+06 5.82950747e+09
 5.75743365e+12 5.68625071e+15 5.61594785e+18 5.54651419e+21
 5.47793898e+24]

Iterative Refinement

[5.3 5.8 5.8 5.8 5.8 5.8 5.8 5.8 5.8]

Preconditoned conjugate Gradient Method

[  4.8        146.91897085 284.92528749 403.94828435 284.07447049
 272.15120805 269.11315158 267.71674158 267.05289403]
Conjugate Gradient Method
[4.80000000e+00 4.96214478e+02 4.96109296e+02 4.95752892e+02
 2.18225266e+04 3.38499900e+06 5.42279810e+08 8.98324804e+10
 1.54068668e+13]
```



In [96]: