```
>> demo_Polynomial_Dictionary_Learning
Starting to train the dictionary
solving the quadratic problem with YALMIP...

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 4 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------- ↙
------
 0|0.000|0.000|2.0e+00|1.5e+01|1.3e+06| 1.118478e+04| 0:0:00|1.3e+06|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.955|0.955|9.1e-02|6.6e-01|7.2e+04| 1.015993e+04| 0:0:00|1.6e+04|1.0e+00|4.6e-02| ↙
chol 1  1
 2|0.611|0.611|6.5e-02|4.7e-01|6.4e+04| 9.844170e+03| 0:0:00|7.5e+03|9.5e-01|3.0e-02| ↙
chol 1  1
 3|0.762|0.762|2.3e-02|1.6e-01|1.9e+04| 4.189805e+03| 0:0:00|3.2e+02|1.1e+00|1.3e-02| ↙
chol 1  1
 4|0.857|0.857|4.1e-03|3.0e-02|3.1e+03| 8.344427e+02| 0:0:00|1.0e+01|1.3e+00|2.7e-03| ↙
chol 1  1
 5|1.000|1.000|7.5e-04|5.5e-03|6.7e+02| 1.530301e+02| 0:0:00|4.7e+00|1.4e+00|5.1e-04| ↙
chol 1  1
 6|0.680|0.680|6.3e-04|4.7e-03|5.9e+02| 1.201554e+02| 0:0:00|2.5e+00|1.3e+00|4.1e-04| ↙
chol 1  1
 7|1.000|1.000|3.6e-04|2.7e-03|3.5e+02| 4.968524e+01| 0:0:00|1.0e+00|1.3e+00|2.3e-04| ↙
chol 1  1
 8|1.000|1.000|2.0e-04|1.5e-03|1.9e+02|-2.102894e-01| 0:0:00|5.4e-01|1.3e+00|1.3e-04| ↙
chol 1  1
 9|1.000|1.000|9.3e-05|7.2e-04|8.7e+01|-2.737161e+01| 0:0:00|2.9e-01|1.3e+00|6.0e-05| ↙
chol 1  1
10|1.000|1.000|4.2e-05|3.4e-04|3.9e+01|-4.153699e+01| 0:0:00|1.3e-01|1.4e+00|2.8e-05| ↙
chol 1  1
11|1.000|1.000|1.8e-05|1.7e-04|1.6e+01|-4.735925e+01| 0:0:00|6.0e-02|1.4e+00|1.2e-05| ↙
chol 1  1
12|1.000|1.000|7.2e-06|9.9e-05|6.0e+00|-5.002557e+01| 0:0:00|2.4e-02|1.5e+00|5.2e-06| ↙
chol 1  1
13|1.000|1.000|2.9e-06|7.4e-05|2.3e+00|-5.096423e+01| 0:0:00|9.2e-03|1.6e+00|2.2e-06| ↙
chol 1  1
14|1.000|1.000|1.1e-06|6.3e-05|7.9e-01|-5.135946e+01| 0:0:00|3.6e-03|1.7e+00|9.2e-07| ↙
chol 1  1
15|1.000|1.000|3.8e-07|5.5e-05|2.6e-01|-5.149667e+01| 0:0:00|1.4e-03|1.8e+00|3.4e-07| ↙
chol 1  1
16|1.000|1.000|9.5e-08|2.2e-05|6.2e-02|-5.155185e+01| 0:0:00|5.4e-04|1.9e+00|8.7e-08| ↙
chol 1  1
17|1.000|1.000|4.2e-08|9.0e-06|2.8e-02|-5.156027e+01| 0:0:00|1.4e-04|1.9e+00|3.9e-08| ↙
```

```
chol 1  1
18|1.000|1.000|1.1e-08|3.6e-06|7.3e-03|-5.156608e+01| 0:0:00|6.2e-05|1.9e+00|1.1e-08| ↙
chol 1  1
19|1.000|1.000|4.8e-09|1.5e-06|3.1e-03|-5.156714e+01| 0:0:00|1.7e-05|1.9e+00|4.6e-09| ↙
chol 1  1
20|1.000|1.000|1.2e-09|5.9e-07|7.7e-04|-5.156781e+01| 0:0:00|7.2e-06|1.9e+00|1.1e-09| ↙
chol 1  1
21|1.000|1.000|5.5e-10|2.4e-07|3.3e-04|-5.156792e+01| 0:0:00|1.8e-06|1.9e+00|4.9e-10| ↙
chol 1  1
22|0.982|0.982|2.2e-10|9.7e-08|8.3e-05|-5.156799e+01| 0:0:00|7.9e-07|2.0e+00|1.2e-10| ↙
chol 1  1
23|1.000|1.000|1.8e-12|3.8e-08|4.7e-05|-5.156800e+01| 0:0:00|2.0e-07|2.0e+00|7.1e-11| ↙
chol 1  1
24|1.000|1.000|9.1e-10|3.8e-08|1.6e-05|-5.156801e+01| 0:0:00|1.1e-07|2.0e+00|2.4e-11| ↙
chol 1  1
25|1.000|1.000|1.7e-09|3.8e-08|5.1e-06|-5.156802e+01| 0:0:00|3.9e-08|2.0e+00|7.2e-12|
  Stop: max(relative gap,infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -5.15680133e+01
 dual   objective value = -5.15680169e+01
 gap := trace(XZ)       = 5.09e-06
 relative gap           = 9.69e-08
 actual relative gap    = 3.47e-08
 rel. primal infeas     = 1.66e-09
 rel. dual   infeas     = 3.77e-08
 norm(X), norm(y), norm(Z) = 3.7e+00, 5.2e+01, 2.0e+01
 norm(A), norm(b), norm(C) = 8.0e+02, 1.0e+00, 7.6e+01
 Total CPU time (secs)  = 0.33
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 1.7e-09  0.0e+00  3.8e-08  0.0e+00  3.5e-08  4.9e-08
-------------------------------------------------------------------

ans =

   51.5680


 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
****************************************************************************** ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
****************************************************************************** ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------ ↙
------
```

```
 0|0.000|0.000|1.0e+00|2.5e+02|2.8e+09| 2.484424e+07| 0:0:00|2.8e+09|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.854|0.854|1.7e-01|4.2e+01|4.9e+08| 2.364831e+07| 0:0:00|3.8e+08|1.0e+00|1.7e-01| ↙
chol 1  1
 2|0.273|0.273|1.8e-01|4.5e+01|7.3e+08| 3.180352e+07| 0:0:00|3.4e+08|8.5e-01|1.5e-01| ↙
chol 1  1
 3|0.924|0.924|2.3e-01|5.7e+01|2.2e+09| 7.524000e+07| 0:0:00|1.8e+08|4.7e-01|1.0e-01| ↙
chol 1  1
 4|0.733|0.733|8.2e-02|2.0e+01|6.7e+08| 5.140992e+07| 0:0:00|7.4e+06|5.7e-01|4.6e-02| ↙
chol 1  1
 5|0.596|0.596|5.0e-02|1.2e+01|3.8e+08| 4.101983e+07| 0:0:00|2.6e+06|6.3e-01|3.1e-02| ↙
chol 1  1
 6|0.719|0.719|2.1e-02|5.2e+00|1.2e+08| 2.122304e+07| 0:0:00|1.3e+05|8.2e-01|1.7e-02| ↙
chol 1  1
 7|1.000|1.000|6.7e-03|1.7e+00|3.7e+07| 8.957577e+06| 0:0:00|9.4e+04|1.0e+00|6.6e-03| ↙
chol 1  1
 8|1.000|1.000|3.5e-03|8.6e-01|1.8e+07| 4.616087e+06| 0:0:00|3.9e+04|1.1e+00|3.6e-03| ↙
chol 1  1
 9|1.000|1.000|1.4e-03|3.4e-01|6.7e+06| 1.731663e+06| 0:0:00|2.1e+04|1.1e+00|1.5e-03| ↙
chol 1  1
10|1.000|1.000|4.9e-04|1.2e-01|2.4e+06| 5.953936e+05| 0:0:00|8.7e+03|1.1e+00|5.6e-04| ↙
chol 1  1
11|0.889|0.889|1.9e-04|4.6e-02|8.7e+05| 2.261766e+05| 0:0:00|3.7e+03|1.2e+00|2.2e-04| ↙
chol 1  1
12|0.992|0.992|1.1e-04|2.6e-02|4.8e+05| 1.184741e+05| 0:0:00|1.1e+03|1.2e+00|1.3e-04| ↙
chol 1  1
13|1.000|1.000|6.4e-05|1.6e-02|2.9e+05| 7.275614e+04| 0:0:00|7.0e+02|1.2e+00|7.8e-05| ↙
chol 1  1
14|1.000|1.000|2.4e-05|6.0e-03|1.0e+05| 2.657508e+04| 0:0:00|4.0e+02|1.3e+00|3.0e-05| ↙
chol 1  1
15|1.000|1.000|1.4e-05|3.4e-03|5.7e+04| 1.445418e+04| 0:0:00|1.5e+02|1.3e+00|1.8e-05| ↙
chol 1  1
16|1.000|1.000|4.5e-06|1.1e-03|1.8e+04| 4.711557e+03| 0:0:00|8.4e+01|1.4e+00|6.2e-06| ↙
chol 1  1
17|1.000|1.000|2.1e-06|5.3e-04|7.9e+03| 2.056793e+03| 0:0:00|2.5e+01|1.5e+00|3.1e-06| ↙
chol 1  1
18|1.000|1.000|7.4e-07|1.9e-04|2.5e+03| 6.560658e+02| 0:0:00|1.2e+01|1.6e+00|1.2e-06| ↙
chol 1  1
19|1.000|1.000|3.0e-07|8.2e-05|9.4e+02| 2.272134e+02| 0:0:00|3.9e+00|1.7e+00|5.1e-07| ↙
chol 1  1
20|1.000|1.000|9.1e-08|4.0e-05|2.7e+02| 4.099204e+01| 0:0:00|1.7e+00|1.9e+00|1.7e-07| ↙
chol 1  1
21|1.000|1.000|2.8e-08|3.0e-05|8.1e+01|-1.462346e+01| 0:0:00|5.5e-01|1.9e+00|5.3e-08| ↙
chol 1  1
22|1.000|1.000|7.9e-09|2.6e-05|2.2e+01|-3.159782e+01| 0:0:00|1.8e-01|1.9e+00|1.5e-08| ↙
chol 1  1
23|1.000|1.000|2.5e-09|2.4e-05|7.2e+00|-3.615477e+01| 0:0:00|5.2e-02|2.0e+00|4.9e-09| ↙
chol 1  1
24|1.000|1.000|7.8e-10|2.1e-05|2.2e+00|-3.760435e+01| 0:0:00|1.7e-02|2.0e+00|1.5e-09| ↙
chol 1  1
25|0.913|0.913|1.5e-10|3.6e-06|4.1e-01|-3.813895e+01| 0:0:00|6.2e-03|2.0e+00|2.9e-10| ↙
chol 1  1
26|0.990|0.990|6.0e-11|2.1e-07|1.7e-01|-3.820649e+01| 0:0:00|1.0e-03|2.0e+00|1.2e-10| ↙
chol 1  1
27|1.000|1.000|1.7e-11|7.0e-08|4.7e-02|-3.826176e+01| 0:0:00|4.1e-04|2.0e+00|3.2e-11| ↙
```

```
chol 1  1
28|1.000|1.000|5.0e-12|7.0e-08|1.4e-02|-3.827523e+01| 0:0:00|1.1e-04|2.0e+00|9.7e-12| ↙
chol 1  1
29|1.000|1.000|1.1e-12|7.0e-08|2.9e-03|-3.827953e+01| 0:0:00|3.4e-05|2.0e+00|2.0e-12| ↙
chol 1  1
30|1.000|1.000|5.5e-13|7.0e-08|1.0e-03|-3.828027e+01| 0:0:00|7.0e-06|2.0e+00|6.9e-13| ↙
chol 1  1
31|0.968|0.968|7.2e-13|7.0e-08|6.5e-05|-3.828064e+01| 0:0:00|2.5e-06|2.0e+00|4.6e-14| ↙
chol 1  1
32|0.995|0.995|1.2e-12|7.0e-08|5.0e-06|-3.828066e+01| 0:0:00|1.7e-07|2.0e+00|3.5e-15| ↙
chol 1  1
33|1.000|1.000|5.4e-12|7.0e-08|2.0e-07|-3.828067e+01| 0:0:00|1.2e-08|2.0e+00|1.1e-16|
  Stop: max(relative gap,infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 33
 primal objective value = -3.82806655e+01
 dual   objective value = -3.82806656e+01
 gap := trace(XZ)       = 1.99e-07
 relative gap           = 5.06e-09
 actual relative gap    = 1.49e-09
 rel. primal infeas     = 5.41e-12
 rel. dual   infeas     = 6.95e-08
 norm(X), norm(y), norm(Z) = 1.0e+01, 6.5e+01, 2.8e+01
 norm(A), norm(b), norm(C) = 1.9e+04, 6.0e+03, 7.6e+01
 Total CPU time (secs)  = 0.28
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 5.4e-12  0.0e+00  7.0e-08  0.0e+00  1.5e-09  2.6e-09
-------------------------------------------------------------------

ans =

   38.2807

Iteration   2   Total error is: 0.025235

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
****************************************************************************** ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
****************************************************************************** ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.0e+00|2.6e+02|3.9e+09| 3.484081e+07| 0:0:00|3.9e+09|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.911|0.911|1.5e-01|3.8e+01|6.6e+08| 3.533466e+07| 0:0:00|4.4e+08|9.8e-01|1.4e-01| ↙
```

```
chol 1  1
 2|0.445|0.445|1.7e-01|4.3e+01|1.2e+09| 5.442462e+07| 0:0:00|3.5e+08|7.5e-01|1.2e-01| ↙
chol 1  1
 3|1.000|1.000|1.8e-01|4.7e+01|2.7e+09| 1.097194e+08| 0:0:00|1.4e+08|4.4e-01|7.8e-02| ↙
chol 1  1
 4|0.632|0.632|7.4e-02|1.9e+01|8.2e+08| 6.608867e+07| 0:0:00|6.2e+06|5.9e-01|4.3e-02| ↙
chol 1  1
 5|0.724|0.724|3.6e-02|9.3e+00|3.6e+08| 4.659414e+07| 0:0:00|1.2e+06|6.8e-01|2.4e-02| ↙
chol 1  1
 6|0.871|0.871|1.3e-02|3.3e+00|1.1e+08| 2.173340e+07| 0:0:00|6.1e+04|8.8e-01|1.1e-02| ↙
chol 1  1
 7|1.000|1.000|4.9e-03|1.3e+00|3.7e+07| 9.130626e+06| 0:0:00|1.1e+05|1.0e+00|4.9e-03| ↙
chol 1  1
 8|0.974|0.974|1.0e-03|2.7e-01|7.1e+06| 1.842032e+06| 0:0:00|3.6e+04|1.1e+00|1.2e-03| ↙
chol 1  1
 9|0.949|0.949|5.8e-04|1.5e-01|4.0e+06| 9.840224e+05| 0:0:00|1.1e+04|1.1e+00|6.5e-04| ↙
chol 1  1
10|1.000|1.000|1.9e-04|5.0e-02|1.3e+06| 3.292938e+05| 0:0:00|5.2e+03|1.2e+00|2.2e-04| ↙
chol 1  1
11|0.787|0.787|9.6e-05|2.5e-02|6.2e+05| 1.563588e+05| 0:0:00|2.3e+03|1.2e+00|1.1e-04| ↙
chol 1  1
12|1.000|1.000|6.5e-05|1.7e-02|4.1e+05| 1.061274e+05| 0:0:00|8.7e+02|1.2e+00|7.9e-05| ↙
chol 1  1
13|0.840|0.840|2.6e-05|6.9e-03|1.6e+05| 4.138490e+04| 0:0:00|6.2e+02|1.3e+00|3.3e-05| ↙
chol 1  1
14|1.000|1.000|1.7e-05|4.4e-03|1.0e+05| 2.580634e+04| 0:0:00|2.3e+02|1.3e+00|2.2e-05| ↙
chol 1  1
15|1.000|1.000|6.2e-06|1.6e-03|3.6e+04| 9.395282e+03| 0:0:00|1.5e+02|1.4e+00|8.4e-06| ↙
chol 1  1
16|1.000|1.000|2.9e-06|7.5e-04|1.5e+04| 4.020817e+03| 0:0:00|5.0e+01|1.4e+00|4.1e-06| ↙
chol 1  1
17|1.000|1.000|1.1e-06|2.8e-04|5.3e+03| 1.420245e+03| 0:0:00|2.3e+01|1.6e+00|1.6e-06| ↙
chol 1  1
18|1.000|1.000|4.2e-07|1.2e-04|1.9e+03| 5.037436e+02| 0:0:00|8.0e+00|1.7e+00|7.1e-07| ↙
chol 1  1
19|1.000|1.000|1.4e-07|5.2e-05|6.1e+02| 1.435595e+02| 0:0:00|3.4e+00|1.8e+00|2.6e-07| ↙
chol 1  1
20|1.000|1.000|4.3e-08|3.4e-05|1.7e+02| 1.481950e+01| 0:0:00|1.2e+00|1.9e+00|8.1e-08| ↙
chol 1  1
21|1.000|1.000|1.3e-08|2.9e-05|5.0e+01|-2.131227e+01| 0:0:00|3.8e-01|1.9e+00|2.4e-08| ↙
chol 1  1
22|1.000|1.000|3.5e-09|2.6e-05|1.4e+01|-3.217606e+01| 0:0:00|1.1e-01|2.0e+00|6.8e-09| ↙
chol 1  1
23|1.000|1.000|1.2e-09|2.4e-05|4.6e+00|-3.497021e+01| 0:0:00|3.3e-02|2.0e+00|2.2e-09| ↙
chol 1  1
24|0.906|0.906|1.9e-10|4.2e-06|7.3e-01|-3.614835e+01| 0:0:00|1.3e-02|2.0e+00|3.7e-10| ↙
chol 1  1
25|0.980|0.980|8.7e-11|2.7e-07|3.5e-01|-3.624167e+01| 0:0:00|2.0e-03|2.0e+00|1.7e-10| ↙
chol 1  1
26|1.000|1.000|4.1e-11|7.8e-08|1.6e-01|-3.632848e+01| 0:0:00|8.3e-04|2.0e+00|8.0e-11| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 1.2e+28.
  switch to LU factor lu  1  1
27|1.000|1.000|9.8e-12|7.7e-08|3.8e-02|-3.638210e+01| 0:0:00|3.9e-04|2.0e+00|1.9e-11| ↙
lu  1  1
```

```
28|0.979|0.979|1.3e-12|7.7e-08|5.5e-03|-3.639515e+01| 0:0:00|9.7e-05|2.0e+00|2.7e-12| ↙
lu  1  1
29|0.998|0.998|5.9e-13|7.7e-08|5.9e-04|-3.639714e+01| 0:0:00|1.3e-05|2.0e+00|3.0e-13| ↙
lu  1  1
30|0.986|0.986|3.4e-12|7.7e-08|8.7e-06|-3.639738e+01| 0:0:00|1.6e-06|2.0e+00|4.7e-15| ↙
lu  1  1
31|0.990|0.990|1.3e-12|7.7e-08|2.1e-07|-3.639738e+01| 0:0:00|3.8e-08|2.0e+00|9.7e-17|
  Stop: max(relative gap,infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 31
 primal objective value = -3.63974445e+01
 dual   objective value = -3.63973139e+01
 gap := trace(XZ)       = 2.15e-07
 relative gap           = 5.75e-09
 actual relative gap    = -1.77e-06
 rel. primal infeas     = 1.32e-12
 rel. dual   infeas     = 7.73e-08
 norm(X), norm(y), norm(Z) = 4.6e+03, 6.7e+01, 3.0e+01
 norm(A), norm(b), norm(C) = 2.0e+04, 8.4e+03, 7.6e+01
 Total CPU time (secs)  = 0.26
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 1.3e-12  0.0e+00  7.7e-08  0.0e+00  -1.8e-06  2.9e-09
-------------------------------------------------------------------

ans =

   36.3973

Iteration   3   Total error is: 0.024589

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.0e+00|2.9e+02|4.7e+09| 4.180870e+07| 0:0:00|4.7e+09|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.927|0.927|1.4e-01|4.0e+01|7.7e+08| 4.307213e+07| 0:0:00|4.9e+08|9.7e-01|1.4e-01| ↙
chol 1  1
 2|0.508|0.508|1.6e-01|4.6e+01|1.5e+09| 7.017497e+07| 0:0:00|3.7e+08|7.1e-01|1.1e-01| ↙
chol 1  1
 3|1.000|1.000|1.8e-01|5.1e+01|3.4e+09| 1.382220e+08| 0:0:00|1.5e+08|4.2e-01|7.5e-02| ↙
chol 1  1
```

```
 4|0.668|0.668|8.3e-02|2.3e+01|1.2e+09| 8.811151e+07| 0:0:00|7.3e+06|5.5e-01|4.4e-02| ↙
chol 1  1
 5|0.743|0.743|3.4e-02|9.5e+00|3.9e+08| 5.149125e+07| 0:0:00|3.9e+05|7.0e-01|2.3e-02| ↙
chol 1  1
 6|1.000|1.000|9.9e-03|2.8e+00|1.0e+08| 2.210703e+07| 0:0:00|2.2e+05|9.1e-01|8.8e-03| ↙
chol 1  1
 7|1.000|1.000|3.5e-03|9.8e-01|3.0e+07| 7.680600e+06| 0:0:00|7.8e+04|1.0e+00|3.6e-03| ↙
chol 1  1
 8|0.865|0.865|7.6e-04|2.1e-01|6.1e+06| 1.629348e+06| 0:0:00|3.8e+04|1.1e+00|8.4e-04| ↙
chol 1  1
 9|0.857|0.857|5.1e-04|1.4e-01|4.2e+06| 1.031572e+06| 0:0:00|1.3e+04|1.1e+00|5.6e-04| ↙
chol 1  1
10|1.000|1.000|1.5e-04|4.1e-02|1.2e+06| 2.979791e+05| 0:0:00|5.4e+03|1.2e+00|1.7e-04| ↙
chol 1  1
11|0.774|0.774|7.6e-05|2.1e-02|5.8e+05| 1.481174e+05| 0:0:00|2.2e+03|1.2e+00|9.0e-05| ↙
chol 1  1
12|1.000|1.000|5.0e-05|1.4e-02|3.8e+05| 9.808156e+04| 0:0:00|8.1e+02|1.2e+00|6.1e-05| ↙
chol 1  1
13|0.985|0.985|1.9e-05|5.4e-03|1.4e+05| 3.588431e+04| 0:0:00|5.3e+02|1.3e+00|2.4e-05| ↙
chol 1  1
14|1.000|1.000|1.2e-05|3.5e-03|8.7e+04| 2.247873e+04| 0:0:00|2.0e+02|1.3e+00|1.6e-05| ↙
chol 1  1
15|1.000|1.000|4.3e-06|1.2e-03|2.9e+04| 7.496470e+03| 0:0:00|1.3e+02|1.4e+00|5.8e-06| ↙
chol 1  1
16|1.000|1.000|2.0e-06|5.6e-04|1.2e+04| 3.284548e+03| 0:0:00|3.9e+01|1.5e+00|2.9e-06| ↙
chol 1  1
17|1.000|1.000|7.0e-07|2.0e-04|4.0e+03| 1.068299e+03| 0:0:00|1.9e+01|1.6e+00|1.1e-06| ↙
chol 1  1
18|1.000|1.000|2.8e-07|8.8e-05|1.5e+03| 3.846142e+02| 0:0:00|6.2e+00|1.8e+00|4.8e-07| ↙
chol 1  1
19|1.000|1.000|8.1e-08|4.3e-05|4.0e+02| 8.386099e+01| 0:0:00|2.7e+00|1.9e+00|1.5e-07| ↙
chol 1  1
20|1.000|1.000|2.5e-08|3.3e-05|1.2e+02| 7.948713e-01| 0:0:00|8.3e-01|1.9e+00|4.8e-08| ↙
chol 1  1
21|1.000|1.000|6.5e-09|2.9e-05|3.1e+01|-2.593027e+01| 0:0:00|2.7e-01|2.0e+00|1.3e-08| ↙
chol 1  1
22|1.000|1.000|2.0e-09|2.6e-05|9.3e+00|-3.250940e+01| 0:0:00|7.2e-02|2.0e+00|3.8e-09| ↙
chol 1  1
23|0.913|0.913|3.7e-10|4.5e-06|1.7e+00|-3.478920e+01| 0:0:00|2.6e-02|2.0e+00|7.0e-10| ↙
chol 1  1
24|0.981|0.981|1.7e-10|3.0e-07|8.1e-01|-3.502375e+01| 0:0:00|4.5e-03|2.0e+00|3.3e-10| ↙
chol 1  1
25|1.000|1.000|9.4e-11|1.9e-07|4.4e-01|-3.520956e+01| 0:0:00|1.9e-03|2.0e+00|1.8e-10| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 5.2e+27.
  switch to LU factor lu  1  1
26|1.000|1.000|1.4e-11|1.7e-07|6.8e-02|-3.535673e+01| 0:0:00|1.0e-03|2.0e+00|2.8e-11| ↙
lu  1  1
27|0.996|0.996|2.0e-12|1.7e-07|8.9e-03|-3.537970e+01| 0:0:00|1.6e-04|2.0e+00|3.7e-12| ↙
lu  1  1
28|0.972|0.972|3.5e-13|1.7e-07|4.2e-04|-3.538306e+01| 0:0:00|2.5e-05|2.0e+00|1.8e-13| ↙
lu  1  1
29|0.983|0.983|4.5e-13|1.7e-07|7.0e-06|-3.538322e+01| 0:0:00|1.4e-06|2.0e+00|3.1e-15| ↙
lu  1  1
30|0.993|0.993|1.3e-12|1.7e-07|1.7e-07|-3.538323e+01| 0:0:00|2.8e-08|2.0e+00|8.3e-17| ↙
```

```
lu  1  1
31|0.998|0.998|1.6e-11|1.7e-07|3.3e-09|-3.538323e+01| 0:0:00|5.1e-10|2.0e+00|3.4e-17|
  Stop: relative gap < infeasibility
-----------------------------------------------------------------
 number of iterations   = 31
 primal objective value = -3.53834404e+01
 dual   objective value = -3.53830077e+01
 gap := trace(XZ)       = 6.98e-06
 relative gap           = 1.92e-07
 actual relative gap    = -6.03e-06
 rel. primal infeas     = 4.50e-13
 rel. dual   infeas     = 1.74e-07
 norm(X), norm(y), norm(Z) = 7.0e+03, 6.8e+01, 3.1e+01
 norm(A), norm(b), norm(C) = 2.2e+04, 1.0e+04, 7.6e+01
 Total CPU time (secs)  = 0.25
 CPU time per iteration = 0.01
 termination code       = -1
 DIMACS errors: 4.5e-13  0.0e+00  1.7e-07  0.0e+00  -6.0e-06  9.7e-08
-----------------------------------------------------------------

ans =

   35.3830

Iteration   4   Total error is: 0.024207

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.1e+00|3.1e+02|4.9e+09| 4.305835e+07| 0:0:00|4.9e+09|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.908|0.908|1.5e-01|4.4e+01|7.7e+08| 4.293753e+07| 0:0:00|5.2e+08|9.9e-01|1.4e-01| ↙
chol 1  1
 2|0.574|0.574|1.8e-01|5.3e+01|1.8e+09| 7.726500e+07| 0:0:00|3.9e+08|6.7e-01|1.1e-01| ↙
chol 1  1
 3|0.617|0.617|2.2e-01|6.3e+01|3.4e+09| 1.269871e+08| 0:0:00|2.6e+08|4.7e-01|9.6e-02| ↙
chol 1  1
 4|0.921|0.921|1.1e-01|3.1e+01|1.7e+09| 1.104258e+08| 0:0:00|1.5e+07|4.9e-01|4.8e-02| ↙
chol 1  1
 5|0.668|0.668|4.9e-02|1.4e+01|5.9e+08| 6.406151e+07| 0:0:00|8.2e+05|6.4e-01|2.9e-02| ↙
chol 1  1
 6|1.000|1.000|1.2e-02|3.4e+00|1.2e+08| 2.558481e+07| 0:0:00|1.5e+05|8.8e-01|9.7e-03| ↙
```

```
chol 1  1
 7|1.000|1.000|3.5e-03|1.0e+00|3.0e+07| 7.705184e+06| 0:0:00|9.9e+04|1.0e+00|3.4e-03| ↙
chol 1  1
 8|0.859|0.859|9.3e-04|2.7e-01|7.4e+06| 1.974579e+06| 0:0:00|4.0e+04|1.1e+00|9.7e-04| ↙
chol 1  1
 9|0.990|0.990|4.8e-04|1.4e-01|3.9e+06| 9.752146e+05| 0:0:00|1.0e+04|1.1e+00|5.0e-04| ↙
chol 1  1
10|1.000|1.000|1.4e-04|4.0e-02|1.1e+06| 2.720994e+05| 0:0:00|5.1e+03|1.1e+00|1.5e-04| ↙
chol 1  1
11|0.755|0.755|5.7e-05|1.7e-02|4.3e+05| 1.115928e+05| 0:0:00|2.2e+03|1.2e+00|6.3e-05| ↙
chol 1  1
12|0.854|0.854|4.5e-05|1.3e-02|3.2e+05| 7.858330e+04| 0:0:00|7.5e+02|1.2e+00|5.1e-05| ↙
chol 1  1
13|1.000|1.000|3.3e-05|9.5e-03|2.4e+05| 6.467869e+04| 0:0:00|4.9e+02|1.2e+00|3.8e-05| ↙
chol 1  1
14|0.884|0.884|1.1e-05|3.2e-03|7.8e+04| 1.995286e+04| 0:0:00|3.5e+02|1.3e+00|1.4e-05| ↙
chol 1  1
15|1.000|1.000|6.5e-06|1.9e-03|4.3e+04| 1.135103e+04| 0:0:00|1.1e+02|1.4e+00|8.2e-06| ↙
chol 1  1
16|1.000|1.000|2.1e-06|6.0e-04|1.3e+04| 3.354937e+03| 0:0:00|6.3e+01|1.5e+00|2.8e-06| ↙
chol 1  1
17|1.000|1.000|9.8e-07|2.9e-04|5.6e+03| 1.521116e+03| 0:0:00|1.7e+01|1.6e+00|1.4e-06| ↙
chol 1  1
18|1.000|1.000|3.1e-07|9.8e-05|1.6e+03| 4.211371e+02| 0:0:00|9.1e+00|1.7e+00|4.9e-07| ↙
chol 1  1
19|1.000|1.000|1.2e-07|5.1e-05|6.0e+02| 1.439179e+02| 0:0:00|2.8e+00|1.8e+00|2.1e-07| ↙
chol 1  1
20|1.000|1.000|2.8e-08|3.3e-05|1.3e+02| 4.880502e+00| 0:0:00|1.2e+00|1.9e+00|5.0e-08| ↙
chol 1  1
21|1.000|1.000|1.1e-08|2.9e-05|5.0e+01|-1.976940e+01| 0:0:00|2.9e-01|1.9e+00|1.9e-08| ↙
chol 1  1
22|1.000|1.000|2.0e-09|2.6e-05|9.4e+00|-3.186214e+01| 0:0:00|1.1e-01|2.0e+00|3.7e-09| ↙
chol 1  1
23|0.980|0.980|4.3e-10|2.8e-06|2.0e+00|-3.399405e+01| 0:0:00|2.4e-02|2.0e+00|7.8e-10| ↙
chol 1  1
24|1.000|1.000|2.2e-10|2.1e-06|1.0e+00|-3.441859e+01| 0:0:00|4.7e-03|2.0e+00|4.0e-10| ↙
chol 1  1
25|1.000|1.000|3.7e-11|1.9e-06|1.7e-01|-3.471358e+01| 0:0:00|2.4e-03|2.0e+00|6.7e-11| ↙
chol 1  1
26|0.969|0.969|3.4e-12|1.9e-06|1.5e-02|-3.476687e+01| 0:0:00|4.6e-04|2.0e+00|6.2e-12| ↙
chol 1  1
27|0.978|0.978|3.0e-13|1.9e-06|4.2e-04|-3.477214e+01| 0:0:00|4.6e-05|2.0e+00|1.8e-13| ↙
chol 1  1
28|0.989|0.989|3.2e-13|1.9e-06|4.8e-06|-3.477228e+01| 0:0:00|1.6e-06|2.0e+00|2.2e-15| ↙
chol 1  1
29|0.990|0.990|3.0e-12|1.9e-06|1.3e-07|-3.477229e+01| 0:0:00|2.8e-08|2.0e+00|2.6e-17|
  Stop: relative gap < infeasibility
-----------------------------------------------------------------
 number of iterations   = 29
 primal objective value = -3.47729076e+01
 dual   objective value = -3.47716603e+01
 gap := trace(XZ)       = 4.82e-06
 relative gap           = 1.35e-07
 actual relative gap    = -1.77e-05
 rel. primal infeas     = 3.23e-13
```

```
 rel. dual   infeas     = 1.92e-06
 norm(X), norm(y), norm(Z) = 2.0e+03, 6.9e+01, 3.2e+01
 norm(A), norm(b), norm(C) = 2.4e+04, 1.1e+04, 7.6e+01
 Total CPU time (secs)  = 0.20
 CPU time per iteration = 0.01
 termination code       = -1
 DIMACS errors: 3.2e-13  0.0e+00  1.9e-06  0.0e+00  -1.8e-05  6.8e-08
------------------------------------------------------------------

ans =

   34.7717

Iteration   5   Total error is: 0.023972

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.1e+00|3.4e+02|5.9e+09| 5.255960e+07| 0:0:00|5.9e+09|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.948|0.948|1.4e-01|4.2e+01|8.7e+08| 5.444104e+07| 0:0:00|5.1e+08|9.7e-01|1.2e-01| ↙
chol 1  1
 2|0.613|0.613|1.6e-01|4.9e+01|1.9e+09| 9.448843e+07| 0:0:00|3.6e+08|6.7e-01|9.5e-02| ↙
chol 1  1
 3|0.894|0.894|1.7e-01|5.3e+01|3.5e+09| 1.608162e+08| 0:0:00|1.6e+08|4.4e-01|6.8e-02| ↙
chol 1  1
 4|0.740|0.740|8.9e-02|2.7e+01|1.5e+09| 1.105441e+08| 0:0:00|9.4e+06|5.4e-01|4.2e-02| ↙
chol 1  1
 5|0.723|0.723|3.7e-02|1.1e+01|4.9e+08| 6.343041e+07| 0:0:00|4.9e+05|7.0e-01|2.3e-02| ↙
chol 1  1
 6|1.000|1.000|9.8e-03|3.0e+00|1.1e+08| 2.521996e+07| 0:0:00|2.6e+05|9.2e-01|8.1e-03| ↙
chol 1  1
 7|0.999|0.999|1.6e-03|5.0e-01|1.6e+07| 4.126883e+06| 0:0:00|7.3e+04|1.1e+00|1.6e-03| ↙
chol 1  1
 8|0.591|0.591|1.1e-03|3.4e-01|1.1e+07| 2.818144e+06| 0:0:00|4.2e+04|1.1e+00|1.1e-03| ↙
chol 1  1
 9|0.958|0.958|4.4e-04|1.3e-01|4.1e+06| 1.070641e+06| 0:0:00|1.5e+04|1.1e+00|4.5e-04| ↙
chol 1  1
10|0.897|0.897|2.8e-04|8.4e-02|2.6e+06| 6.640243e+05| 0:0:00|6.6e+03|1.1e+00|2.8e-04| ↙
chol 1  1
11|0.984|0.984|1.5e-04|4.4e-02|1.3e+06| 3.380991e+05| 0:0:00|3.4e+03|1.2e+00|1.5e-04| ↙
chol 1  1
```

```
12|1.000|1.000|6.2e-05|1.9e-02|5.5e+05| 1.424716e+05| 0:0:00|1.8e+03|1.2e+00|6.6e-05| ↙
chol 1  1
13|1.000|1.000|2.8e-05|8.7e-03|2.4e+05| 6.304891e+04| 0:0:00|7.2e+02|1.2e+00|3.2e-05| ↙
chol 1  1
14|1.000|1.000|1.6e-05|5.0e-03|1.3e+05| 3.507975e+04| 0:0:00|3.4e+02|1.3e+00|1.9e-05| ↙
chol 1  1
15|1.000|1.000|6.1e-06|1.9e-03|4.8e+04| 1.256288e+04| 0:0:00|1.9e+02|1.4e+00|7.4e-06| ↙
chol 1  1
16|1.000|1.000|2.9e-06|8.7e-04|2.1e+04| 5.610975e+03| 0:0:00|6.6e+01|1.4e+00|3.7e-06| ↙
chol 1  1
17|1.000|1.000|1.0e-06|3.2e-04|7.0e+03| 1.878697e+03| 0:0:00|3.2e+01|1.6e+00|1.4e-06| ↙
chol 1  1
18|1.000|1.000|4.2e-07|1.3e-04|2.6e+03| 7.081725e+02| 0:0:00|1.0e+01|1.7e+00|6.4e-07| ↙
chol 1  1
19|1.000|1.000|1.3e-07|5.4e-05|7.6e+02| 1.895665e+02| 0:0:00|4.6e+00|1.8e+00|2.2e-07| ↙
chol 1  1
20|1.000|1.000|4.2e-08|3.5e-05|2.3e+02| 3.447900e+01| 0:0:00|1.5e+00|1.9e+00|7.1e-08| ↙
chol 1  1
21|1.000|1.000|1.0e-08|2.9e-05|5.7e+01|-1.718651e+01| 0:0:00|5.0e-01|1.9e+00|1.8e-08| ↙
chol 1  1
22|1.000|1.000|3.2e-09|2.6e-05|1.7e+01|-2.921447e+01| 0:0:00|1.3e-01|2.0e+00|5.6e-09| ↙
chol 1  1
23|1.000|1.000|7.3e-10|2.4e-05|3.9e+00|-3.320991e+01| 0:0:00|4.0e-02|2.0e+00|1.3e-09| ↙
chol 1  1
24|0.904|0.904|1.3e-10|4.2e-06|6.7e-01|-3.422173e+01| 0:0:00|1.2e-02|2.0e+00|2.3e-10| ↙
chol 1  1
25|0.715|0.715|7.1e-11|1.3e-06|3.8e-01|-3.430510e+01| 0:0:00|4.7e-03|2.0e+00|1.2e-10| ↙
chol 1  1
26|0.952|0.952|3.2e-11|8.1e-08|1.7e-01|-3.437535e+01| 0:0:00|1.1e-03|2.0e+00|5.6e-11| ↙
chol 1  1
27|1.000|1.000|1.3e-11|1.8e-08|6.6e-02|-3.442687e+01| 0:0:00|4.2e-04|2.0e+00|2.1e-11| ↙
chol
  SMW too ill-conditioned, switch to LU factor, 2.4e+29.
  switch to LU factor lu  1  1
28|1.000|1.000|1.5e-12|1.7e-08|6.7e-03|-3.445397e+01| 0:0:00|1.6e-04|2.0e+00|2.2e-12| ↙
lu  1  1
29|0.979|0.979|2.1e-12|1.7e-08|2.0e-04|-3.445674e+01| 0:0:00|1.9e-05|2.0e+00|6.9e-14| ↙
lu  1  1
30|0.992|0.992|3.0e-12|1.7e-08|5.5e-06|-3.445682e+01| 0:0:00|6.5e-07|2.0e+00|1.9e-15| ↙
lu  1  1
31|0.994|0.994|6.5e-12|1.7e-08|1.0e-07|-3.445682e+01| 0:0:00|1.8e-08|2.0e+00|0.0e+00|
  Stop: max(relative gap,infeasibilities) < 1.00e-07
-----------------------------------------------------------------
 number of iterations   = 31
 primal objective value = -3.44568379e+01
 dual   objective value = -3.44568115e+01
 gap := trace(XZ)       = 1.01e-07
 relative gap           = 2.86e-09
 actual relative gap    = -3.78e-07
 rel. primal infeas     = 6.50e-12
 rel. dual   infeas     = 1.73e-08
 norm(X), norm(y), norm(Z) = 4.7e+03, 6.9e+01, 3.2e+01
 norm(A), norm(b), norm(C) = 2.6e+04, 1.4e+04, 7.6e+01
 Total CPU time (secs)  = 0.25
 CPU time per iteration = 0.01
```

```
 termination code       =  0
 DIMACS errors: 6.5e-12  0.0e+00  1.7e-08  0.0e+00  -3.8e-07  1.5e-09
------------------------------------------------------------------

ans =

   34.4568

Iteration   6   Total error is: 0.023845

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.2e+00|3.7e+02|6.9e+09| 6.079845e+07| 0:0:00|6.9e+09|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.976|0.976|1.3e-01|4.2e+01|9.7e+08| 6.497865e+07| 0:0:00|5.0e+08|9.5e-01|1.1e-01| ↙
chol 1  1
 2|0.644|0.644|1.5e-01|4.7e+01|2.0e+09| 1.088337e+08| 0:0:00|3.3e+08|6.6e-01|8.4e-02| ↙
chol 1  1
 3|0.997|0.997|1.4e-01|4.4e+01|3.0e+09| 1.684603e+08| 0:0:00|1.0e+08|4.6e-01|5.5e-02| ↙
chol 1  1
 4|0.687|0.687|7.2e-02|2.3e+01|1.2e+09| 1.060561e+08| 0:0:00|6.4e+06|5.9e-01|3.6e-02| ↙
chol 1  1
 5|0.754|0.754|2.8e-02|8.9e+00|3.8e+08| 5.727800e+07| 0:0:00|3.1e+05|7.6e-01|1.8e-02| ↙
chol 1  1
 6|1.000|1.000|7.2e-03|2.3e+00|8.7e+07| 2.069510e+07| 0:0:00|2.6e+05|9.7e-01|6.1e-03| ↙
chol 1  1
 7|0.919|0.919|1.3e-03|4.2e-01|1.4e+07| 3.678787e+06| 0:0:00|7.6e+04|1.1e+00|1.3e-03| ↙
chol 1  1
 8|0.539|0.539|9.2e-04|3.0e-01|9.6e+06| 2.554732e+06| 0:0:00|4.5e+04|1.1e+00|8.9e-04| ↙
chol 1  1
 9|0.957|0.957|4.5e-04|1.5e-01|4.7e+06| 1.230859e+06| 0:0:00|1.4e+04|1.1e+00|4.4e-04| ↙
chol 1  1
10|1.000|1.000|2.7e-04|8.8e-02|2.9e+06| 7.459845e+05| 0:0:00|6.5e+03|1.1e+00|2.7e-04| ↙
chol 1  1
11|1.000|1.000|7.5e-05|2.4e-02|7.6e+05| 1.853693e+05| 0:0:00|3.7e+03|1.2e+00|7.6e-05| ↙
chol 1  1
12|0.722|0.722|2.8e-05|9.0e-03|2.7e+05| 6.806278e+04| 0:0:00|1.6e+03|1.2e+00|2.9e-05| ↙
chol 1  1
13|1.000|1.000|1.9e-05|6.0e-03|1.7e+05| 4.358991e+04| 0:0:00|3.1e+02|1.3e+00|2.1e-05| ↙
chol 1  1
14|1.000|1.000|9.6e-06|3.1e-03|8.5e+04| 2.319395e+04| 0:0:00|2.6e+02|1.3e+00|1.1e-05| ↙
```

```
chol 1  1
15|1.000|1.000|3.5e-06|1.1e-03|2.9e+04| 7.579755e+03| 0:0:00|1.2e+02|1.4e+00|4.3e-06| ↙
chol 1  1
16|1.000|1.000|1.8e-06|5.7e-04|1.4e+04| 3.732899e+03| 0:0:00|4.2e+01|1.5e+00|2.3e-06| ↙
chol 1  1
17|1.000|1.000|5.8e-07|1.9e-04|4.1e+03| 1.098487e+03| 0:0:00|2.1e+01|1.7e+00|8.3e-07| ↙
chol 1  1
18|1.000|1.000|2.4e-07|8.8e-05|1.6e+03| 4.384111e+02| 0:0:00|6.6e+00|1.8e+00|3.7e-07| ↙
chol 1  1
19|1.000|1.000|6.4e-08|4.2e-05|4.0e+02| 8.169140e+01| 0:0:00|3.1e+00|1.9e+00|1.0e-07| ↙
chol 1  1
20|1.000|1.000|2.3e-08|3.3e-05|1.4e+02| 8.476462e+00| 0:0:00|8.4e-01|1.9e+00|3.9e-08| ↙
chol 1  1
21|1.000|1.000|4.9e-09|2.9e-05|3.0e+01|-2.520528e+01| 0:0:00|3.2e-01|2.0e+00|8.3e-09| ↙
chol 1  1
22|1.000|1.000|2.1e-09|2.6e-05|1.2e+01|-3.028681e+01| 0:0:00|7.0e-02|2.0e+00|3.5e-09| ↙
chol 1  1
23|0.904|0.904|3.4e-10|4.7e-06|1.9e+00|-3.347953e+01| 0:0:00|3.3e-02|2.0e+00|5.7e-10| ↙
chol 1  1
24|0.992|0.992|1.2e-10|2.5e-07|7.4e-01|-3.379583e+01| 0:0:00|4.9e-03|2.0e+00|2.1e-10| ↙
chol 1  1
25|1.000|1.000|4.3e-11|1.9e-07|2.6e-01|-3.402590e+01| 0:0:00|1.8e-03|2.0e+00|7.3e-11| ↙
chol 1  1
26|0.987|0.987|5.0e-12|1.9e-07|2.9e-02|-3.411612e+01| 0:0:00|6.3e-04|2.0e+00|8.2e-12| ↙
chol 1  1
27|0.975|0.975|6.5e-13|1.9e-07|1.2e-03|-3.412698e+01| 0:0:00|8.3e-05|2.0e+00|3.5e-13| ↙
chol 1  1
28|0.986|0.986|3.0e-13|1.9e-07|1.6e-05|-3.412745e+01| 0:0:00|4.1e-06|2.0e+00|5.2e-15| ↙
chol 1  1
29|0.991|0.991|6.5e-13|1.9e-07|3.9e-07|-3.412746e+01| 0:0:00|8.1e-08|2.0e+00|1.2e-16| ↙
chol 1  1
30|0.993|0.993|3.8e-12|1.9e-07|8.6e-09|-3.412746e+01| 0:0:00|1.6e-09|2.0e+00|4.0e-17|
  Stop: relative gap < infeasibility
-----------------------------------------------------------------
 number of iterations   = 30
 primal objective value = -3.41275257e+01
 dual   objective value = -3.41273905e+01
 gap := trace(XZ)       = 3.91e-07
 relative gap           = 1.11e-08
 actual relative gap    = -1.95e-06
 rel. primal infeas     = 6.49e-13
 rel. dual   infeas     = 1.92e-07
 norm(X), norm(y), norm(Z) = 2.2e+03, 6.9e+01, 3.3e+01
 norm(A), norm(b), norm(C) = 2.9e+04, 1.7e+04, 7.6e+01
 Total CPU time (secs)  = 0.25
 CPU time per iteration = 0.01
 termination code       = -1
 DIMACS errors: 6.5e-13  0.0e+00  1.9e-07  0.0e+00  -2.0e-06  5.7e-09
-----------------------------------------------------------------

ans =

   34.1274

Iteration   7   Total error is: 0.023749
```

```
 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.2e+00|3.8e+02|7.6e+09| 6.767703e+07| 0:0:00|7.6e+09|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.999|0.999|1.2e-01|4.0e+01|1.0e+09| 7.424327e+07| 0:0:00|4.9e+08|9.4e-01|9.9e-02| ↙
chol 1  1
 2|0.659|0.659|1.3e-01|4.3e+01|1.9e+09| 1.188109e+08| 0:0:00|3.1e+08|6.7e-01|7.5e-02| ↙
chol 1  1
 3|1.000|1.000|1.1e-01|3.6e+01|2.5e+09| 1.624917e+08| 0:0:00|7.7e+07|5.0e-01|4.8e-02| ↙
chol 1  1
 4|0.679|0.679|5.6e-02|1.8e+01|9.7e+08| 9.761235e+07| 0:0:00|4.7e+06|6.4e-01|3.1e-02| ↙
chol 1  1
 5|0.751|0.751|2.0e-02|6.4e+00|2.7e+08| 4.544696e+07| 0:0:00|2.1e+05|8.5e-01|1.4e-02| ↙
chol 1  1
 6|1.000|1.000|4.0e-03|1.3e+00|5.0e+07| 1.278774e+07| 0:0:00|2.2e+05|1.1e+00|3.7e-03| ↙
chol 1  1
 7|0.880|0.880|1.3e-03|4.1e-01|1.5e+07| 3.879822e+06| 0:0:00|6.8e+04|1.1e+00|1.2e-03| ↙
chol 1  1
 8|0.795|0.795|6.6e-04|2.2e-01|7.6e+06| 2.054755e+06| 0:0:00|2.9e+04|1.1e+00|6.5e-04| ↙
chol 1  1
 9|1.000|1.000|4.6e-04|1.5e-01|5.3e+06| 1.380725e+06| 0:0:00|1.1e+04|1.1e+00|4.5e-04| ↙
chol 1  1
10|1.000|1.000|3.2e-04|1.0e-01|3.7e+06| 9.667453e+05| 0:0:00|7.2e+03|1.1e+00|3.1e-04| ↙
chol 1  1
11|1.000|1.000|1.3e-04|4.2e-02|1.4e+06| 3.661710e+05| 0:0:00|4.9e+03|1.2e+00|1.3e-04| ↙
chol 1  1
12|0.885|0.885|5.0e-05|1.6e-02|5.4e+05| 1.419721e+05| 0:0:00|2.2e+03|1.2e+00|5.1e-05| ↙
chol 1  1
13|0.884|0.884|3.6e-05|1.2e-02|3.8e+05| 9.736488e+04| 0:0:00|8.5e+02|1.3e+00|3.9e-05| ↙
chol 1  1
14|1.000|1.000|2.3e-05|7.5e-03|2.3e+05| 6.388062e+04| 0:0:00|5.6e+02|1.3e+00|2.5e-05| ↙
chol 1  1
15|1.000|1.000|8.8e-06|2.9e-03|8.7e+04| 2.279475e+04| 0:0:00|3.3e+02|1.3e+00|1.0e-05| ↙
chol 1  1
16|1.000|1.000|5.1e-06|1.7e-03|4.8e+04| 1.267496e+04| 0:0:00|1.3e+02|1.4e+00|6.1e-06| ↙
chol 1  1
17|1.000|1.000|1.7e-06|5.5e-04|1.5e+04| 3.910035e+03| 0:0:00|7.2e+01|1.5e+00|2.1e-06| ↙
chol 1  1
18|1.000|1.000|7.8e-07|2.6e-04|6.3e+03| 1.719252e+03| 0:0:00|2.0e+01|1.6e+00|1.1e-06| ↙
chol 1  1
```

```
19|1.000|1.000|2.5e-07|8.9e-05|1.9e+03| 4.977804e+02| 0:0:00|1.1e+01|1.8e+00|3.8e-07| ↙
chol 1  1
20|1.000|1.000|9.6e-08|4.5e-05|6.7e+02| 1.645697e+02| 0:0:00|3.4e+00|1.9e+00|1.5e-07| ↙
chol 1  1
21|1.000|1.000|2.3e-08|3.0e-05|1.6e+02| 1.320670e+01| 0:0:00|1.4e+00|1.9e+00|3.8e-08| ↙
chol 1  1
22|1.000|1.000|8.4e-09|2.6e-05|5.6e+01|-1.709733e+01| 0:0:00|3.5e-01|1.9e+00|1.4e-08| ↙
chol 1  1
23|1.000|1.000|1.9e-09|2.4e-05|1.3e+01|-3.000957e+01| 0:0:00|1.3e-01|2.0e+00|3.2e-09| ↙
chol 1  1
24|0.926|0.926|3.9e-10|3.7e-06|2.6e+00|-3.298566e+01| 0:0:00|3.7e-02|2.0e+00|6.6e-10| ↙
chol 1  1
25|1.000|1.000|2.1e-10|1.9e-06|1.4e+00|-3.340053e+01| 0:0:00|6.1e-03|2.0e+00|3.5e-10| ↙
chol 1  1
26|1.000|1.000|3.7e-11|1.7e-06|2.5e-01|-3.382660e+01| 0:0:00|3.3e-03|2.0e+00|6.3e-11| ↙
chol 1  1
27|0.985|0.985|4.3e-12|1.7e-06|2.8e-02|-3.390305e+01| 0:0:00|6.3e-04|2.0e+00|7.3e-12| ↙
chol 1  1
28|0.982|0.982|2.5e-13|1.7e-06|5.4e-04|-3.391305e+01| 0:0:00|7.8e-05|2.0e+00|1.5e-13| ↙
chol 1  1
29|0.987|0.987|1.2e-12|1.7e-06|7.0e-06|-3.391324e+01| 0:0:00|2.4e-06|2.0e+00|2.1e-15| ↙
chol 1  1
30|0.982|0.982|2.4e-11|1.7e-06|3.5e-07|-3.391324e+01| 0:0:00|6.2e-08|2.0e+00|1.2e-16|
  Stop: relative gap < infeasibility
-----------------------------------------------------------------
 number of iterations   = 30
 primal objective value = -3.39132398e+01
 dual   objective value = -3.39132448e+01
 gap := trace(XZ)       = 7.01e-06
 relative gap           = 2.01e-07
 actual relative gap    = 7.37e-08
 rel. primal infeas     = 1.19e-12
 rel. dual   infeas     = 1.73e-06
 norm(X), norm(y), norm(Z) = 1.3e+01, 6.9e+01, 3.3e+01
 norm(A), norm(b), norm(C) = 3.0e+04, 1.9e+04, 7.6e+01
 Total CPU time (secs)  = 0.25
 CPU time per iteration = 0.01
 termination code       = -1
 DIMACS errors: 1.2e-12  0.0e+00  1.7e-06  0.0e+00  7.4e-08  1.0e-07
-----------------------------------------------------------------

ans =

   33.9132

Iteration   8   Total error is: 0.023658
The total representation error of the testing signals is: 0.23473
>> demo_Polynomial_Dictionary_Learning
Starting to train the dictionary
solving the quadratic problem with YALMIP...

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.
```

```
 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|2.0e+00|1.5e+01|1.3e+06| 1.118478e+04| 0:0:00|1.3e+06|1.0e+00|1.0e+00| ↙
chol 1  1
 1|0.955|0.955|9.1e-02|6.6e-01|7.2e+04| 1.016116e+04| 0:0:00|1.6e+04|1.0e+00|4.6e-02| ↙
chol 1  1
 2|0.609|0.609|6.5e-02|4.7e-01|6.5e+04| 9.866220e+03| 0:0:00|7.6e+03|9.5e-01|3.0e-02| ↙
chol 1  1
 3|0.764|0.764|2.3e-02|1.6e-01|1.9e+04| 4.224583e+03| 0:0:00|3.2e+02|1.1e+00|1.3e-02| ↙
chol 1  1
 4|0.856|0.856|4.1e-03|3.0e-02|3.1e+03| 8.461728e+02| 0:0:00|1.0e+01|1.3e+00|2.7e-03| ↙
chol 1  1
 5|1.000|1.000|7.5e-04|5.4e-03|6.7e+02| 1.532070e+02| 0:0:00|4.7e+00|1.4e+00|5.0e-04| ↙
chol 1  1
 6|0.709|0.709|6.2e-04|4.6e-03|5.9e+02| 1.182618e+02| 0:0:00|2.4e+00|1.3e+00|4.0e-04| ↙
chol 1  1
 7|1.000|1.000|3.5e-04|2.6e-03|3.3e+02| 4.618701e+01| 0:0:00|9.8e-01|1.3e+00|2.2e-04| ↙
chol 1  1
 8|1.000|1.000|1.9e-04|1.4e-03|1.8e+02|-1.954382e+00| 0:0:00|5.2e-01|1.3e+00|1.2e-04| ↙
chol 1  1
 9|1.000|1.000|8.7e-05|6.8e-04|8.2e+01|-2.868076e+01| 0:0:00|2.8e-01|1.3e+00|5.7e-05| ↙
chol 1  1
10|1.000|1.000|4.0e-05|3.3e-04|3.6e+01|-4.204088e+01| 0:0:00|1.3e-01|1.4e+00|2.6e-05| ↙
chol 1  1
11|1.000|1.000|1.7e-05|1.6e-04|1.5e+01|-4.759297e+01| 0:0:00|5.6e-02|1.4e+00|1.1e-05| ↙
chol 1  1
12|1.000|1.000|6.7e-06|9.7e-05|5.6e+00|-5.010340e+01| 0:0:00|2.2e-02|1.5e+00|4.9e-06| ↙
chol 1  1
13|1.000|1.000|2.7e-06|7.3e-05|2.1e+00|-5.099101e+01| 0:0:00|8.6e-03|1.6e+00|2.1e-06| ↙
chol 1  1
14|1.000|1.000|1.0e-06|6.3e-05|7.3e-01|-5.136648e+01| 0:0:00|3.4e-03|1.7e+00|8.6e-07| ↙
chol 1  1
15|1.000|1.000|3.5e-07|5.5e-05|2.4e-01|-5.149704e+01| 0:0:00|1.3e-03|1.8e+00|3.2e-07| ↙
chol 1  1
16|1.000|1.000|8.5e-08|2.2e-05|5.6e-02|-5.155000e+01| 0:0:00|5.0e-04|1.9e+00|7.8e-08| ↙
chol 1  1
17|1.000|1.000|3.8e-08|9.0e-06|2.5e-02|-5.155808e+01| 0:0:00|1.2e-04|1.9e+00|3.6e-08| ↙
chol 1  1
18|1.000|1.000|8.9e-09|3.6e-06|5.7e-03|-5.156408e+01| 0:0:00|5.6e-05|1.9e+00|8.3e-09| ↙
chol 1  1
19|1.000|1.000|3.7e-09|1.5e-06|2.3e-03|-5.156501e+01| 0:0:00|1.3e-05|1.9e+00|3.5e-09| ↙
chol 1  1
20|0.994|0.994|7.9e-10|5.8e-07|4.8e-04|-5.156564e+01| 0:0:00|5.5e-06|1.9e+00|7.2e-10| ↙
chol 1  1
21|1.000|1.000|4.0e-10|2.3e-07|2.0e-04|-5.156572e+01| 0:0:00|1.1e-06|2.0e+00|3.0e-10| ↙
```

```
chol 1  1
22|1.000|1.000|2.6e-10|9.3e-08|5.7e-05|-5.156577e+01| 0:0:00|4.7e-07|2.0e+00|8.6e-11| ↙
chol 1  1
23|1.000|1.000|1.3e-09|9.2e-08|1.9e-05|-5.156579e+01| 0:0:00|1.3e-07|2.0e+00|2.9e-11| ↙
chol 1  1
24|1.000|1.000|2.1e-09|9.2e-08|6.2e-06|-5.156579e+01| 0:0:00|4.6e-08|2.0e+00|8.8e-12| ↙
chol 1  1
25|1.000|1.000|2.4e-09|9.2e-08|2.4e-06|-5.156579e+01| 0:0:00|1.5e-08|2.0e+00|2.9e-12|
  Stop: max(relative gap,infeasibilities) < 1.00e-07
-------------------------------------------------------------------
 number of iterations   = 25
 primal objective value = -5.15657927e+01
 dual   objective value = -5.15657936e+01
 gap := trace(XZ)       = 2.40e-06
 relative gap           = 4.57e-08
 actual relative gap    = 8.31e-09
 rel. primal infeas     = 2.39e-09
 rel. dual   infeas     = 9.24e-08
 norm(X), norm(y), norm(Z) = 8.1e+00, 5.2e+01, 2.0e+01
 norm(A), norm(b), norm(C) = 8.0e+02, 1.0e+00, 7.6e+01
 Total CPU time (secs)  = 0.22
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 2.4e-09  0.0e+00  9.2e-08  0.0e+00  8.3e-09  2.3e-08
-------------------------------------------------------------------

ans =

   51.5658


 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.5e+00|1.5e+01|4.7e+07| 4.166279e+05| 0:0:00|4.7e+07|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|1.1e-01|1.1e+00|4.4e+06| 4.306646e+05| 0:0:00|1.6e+06|9.7e-01|7.0e-02| ↙
chol 1  1
 2|0.657|0.657|1.0e-01|1.0e+00|6.9e+06| 5.951862e+05| 0:0:00|9.7e+05|7.3e-01|5.1e-02| ↙
chol 1  1
 3|0.814|0.814|8.4e-02|8.4e-01|7.1e+06| 6.578350e+05| 0:0:00|3.2e+05|6.3e-01|3.5e-02| ↙
chol 1  1
```

```
 4|0.705|0.705|3.7e-02|3.7e-01|2.5e+06| 3.453173e+05| 0:0:00|1.6e+04|7.9e-01|2.0e-02| ↙
chol 1  1
 5|0.761|0.761|9.2e-03|9.2e-02|4.6e+05| 9.521683e+04| 0:0:00|5.2e+02|1.0e+00|6.5e-03| ↙
chol 1  1
 6|0.749|0.749|2.6e-03|2.6e-02|1.2e+05| 2.813504e+04| 0:0:00|5.1e+02|1.2e+00|2.0e-03| ↙
chol 1  1
 7|1.000|1.000|1.7e-03|1.7e-02|9.1e+04| 2.276915e+04| 0:0:00|1.8e+02|1.2e+00|1.3e-03| ↙
chol 1  1
 8|1.000|1.000|1.2e-03|1.2e-02|6.7e+04| 1.784086e+04| 0:0:00|1.3e+02|1.1e+00|9.3e-04| ↙
chol 1  1
 9|0.876|0.876|3.4e-04|3.4e-03|1.8e+04| 4.516672e+03| 0:0:00|9.1e+01|1.2e+00|2.7e-04| ↙
chol 1  1
10|1.000|1.000|2.1e-04|2.1e-03|1.1e+04| 2.861005e+03| 0:0:00|2.4e+01|1.2e+00|1.7e-04| ↙
chol 1  1
11|1.000|1.000|7.6e-05|8.1e-04|3.9e+03| 9.550103e+02| 0:0:00|1.5e+01|1.3e+00|6.4e-05| ↙
chol 1  1
12|1.000|1.000|3.4e-05|3.7e-04|1.7e+03| 4.155127e+02| 0:0:00|5.4e+00|1.3e+00|3.0e-05| ↙
chol 1  1
13|1.000|1.000|1.2e-05|1.5e-04|5.6e+02| 1.098668e+02| 0:0:00|2.4e+00|1.4e+00|1.1e-05| ↙
chol 1  1
14|1.000|1.000|5.1e-06|8.6e-05|2.3e+02| 2.450910e+01| 0:0:00|7.8e-01|1.4e+00|4.9e-06| ↙
chol 1  1
15|1.000|1.000|1.7e-06|6.0e-05|6.9e+01|-2.031167e+01| 0:0:00|3.3e-01|1.6e+00|1.8e-06| ↙
chol 1  1
16|1.000|1.000|6.8e-07|5.1e-05|2.5e+01|-3.223097e+01| 0:0:00|9.9e-02|1.7e+00|7.8e-07| ↙
chol 1  1
17|1.000|1.000|1.7e-07|4.5e-05|5.7e+00|-3.833110e+01| 0:0:00|4.4e-02|1.9e+00|2.1e-07| ↙
chol 1  1
18|1.000|1.000|5.7e-08|4.0e-05|1.9e+00|-3.951805e+01| 0:0:00|1.1e-02|1.9e+00|7.3e-08| ↙
chol 1  1
19|0.977|0.977|1.1e-08|3.6e-05|3.5e-01|-4.002820e+01| 0:0:00|4.3e-03|2.0e+00|1.4e-08| ↙
chol 1  1
20|1.000|1.000|3.8e-09|1.4e-05|1.2e-01|-4.010129e+01| 0:0:00|8.2e-04|2.0e+00|4.9e-09| ↙
chol 1  1
21|0.997|0.997|9.2e-10|5.9e-06|2.9e-02|-4.013367e+01| 0:0:00|2.9e-04|2.0e+00|1.2e-09| ↙
chol 1  1
22|1.000|1.000|4.2e-10|2.4e-06|1.3e-02|-4.013872e+01| 0:0:00|7.0e-05|2.0e+00|5.5e-10| ↙
chol 1  1
23|0.954|0.954|8.6e-11|1.0e-06|2.7e-03|-4.014274e+01| 0:0:00|3.4e-05|2.0e+00|1.1e-10| ↙
chol 1  1
24|0.960|0.960|1.8e-11|8.0e-08|5.6e-04|-4.014346e+01| 0:0:00|7.5e-06|2.0e+00|2.3e-11| ↙
chol 1  1
25|0.829|0.829|7.8e-12|4.7e-08|3.0e-04|-4.014359e+01| 0:0:00|2.4e-06|2.0e+00|1.2e-11| ↙
chol 1  1
26|1.000|1.000|3.3e-11|4.0e-08|5.4e-05|-4.014369e+01| 0:0:00|7.1e-07|2.0e+00|2.2e-12| ↙
chol 1  1
27|1.000|1.000|1.9e-11|4.0e-08|2.8e-05|-4.014370e+01| 0:0:00|1.3e-07|2.0e+00|1.1e-12| ↙
chol 1  1
28|1.000|1.000|4.2e-10|4.0e-08|6.6e-06|-4.014371e+01| 0:0:00|6.6e-08|2.0e+00|2.6e-13| ↙
chol 1  1
29|1.000|1.000|3.9e-10|4.0e-08|2.3e-06|-4.014371e+01| 0:0:00|1.6e-08|2.0e+00|8.9e-14|
  Stop: max(relative gap,infeasibilities) < 1.00e-07
------------------------------------------------------------------
 number of iterations   = 29
 primal objective value = -4.01437112e+01
```

```
 dual   objective value = -4.01437077e+01
 gap := trace(XZ)       = 2.34e-06
 relative gap           = 5.68e-08
 actual relative gap    = -4.36e-08
 rel. primal infeas     = 3.88e-10
 rel. dual   infeas     = 3.98e-08
 norm(X), norm(y), norm(Z) = 1.7e+02, 6.3e+01, 2.7e+01
 norm(A), norm(b), norm(C) = 8.2e+02, 1.5e+02, 7.6e+01
 Total CPU time (secs)  = 0.25
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 3.9e-10  0.0e+00  4.0e-08  0.0e+00  -4.4e-08  2.9e-08
------------------------------------------------------------------

ans =

   40.1437

Iteration   2   Total error is: 0.025842

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------- ↙
------
 0|0.000|0.000|1.1e+00|1.5e+01|8.0e+07| 7.127326e+05| 0:0:00|8.0e+07|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|1.4e-01|1.8e+00|1.3e+07| 8.051765e+05| 0:0:00|6.2e+06|9.3e-01|1.1e-01| ↙
chol 1  1
 2|0.942|0.942|1.1e-01|1.5e+00|2.0e+07| 1.290189e+06| 0:0:00|2.3e+06|6.4e-01|6.3e-02| ↙
chol 1  1
 3|1.000|1.000|7.1e-02|9.4e-01|1.5e+07| 1.281071e+06| 0:0:00|2.1e+05|5.8e-01|3.6e-02| ↙
chol 1  1
 4|0.705|0.705|3.1e-02|4.1e-01|5.2e+06| 7.126966e+05| 0:0:00|1.1e+04|7.4e-01|2.1e-02| ↙
chol 1  1
 5|0.959|0.959|5.5e-03|7.2e-02|7.2e+05| 1.688409e+05| 0:0:00|4.5e+02|1.0e+00|5.0e-03| ↙
chol 1  1
 6|0.710|0.710|1.7e-03|2.2e-02|1.9e+05| 5.023468e+04| 0:0:00|7.2e+02|1.2e+00|1.7e-03| ↙
chol 1  1
 7|1.000|1.000|1.2e-03|1.5e-02|1.4e+05| 3.658829e+04| 0:0:00|2.8e+02|1.2e+00|1.2e-03| ↙
chol 1  1
 8|1.000|1.000|4.7e-04|6.1e-03|5.5e+04| 1.467248e+04| 0:0:00|1.9e+02|1.2e+00|4.9e-04| ↙
chol 1  1
 9|1.000|1.000|2.2e-04|2.9e-03|2.5e+04| 6.398644e+03| 0:0:00|7.4e+01|1.2e+00|2.3e-04| ↙
```

```
chol 1  1
10|1.000|1.000|9.5e-05|1.3e-03|1.1e+04| 2.804159e+03| 0:0:00|3.6e+01|1.3e+00|1.1e-04| ↙
chol 1  1
11|1.000|1.000|3.6e-05|5.0e-04|3.9e+03| 9.703140e+02| 0:0:00|1.5e+01|1.3e+00|4.1e-05| ↙
chol 1  1
12|1.000|1.000|1.5e-05|2.3e-04|1.6e+03| 3.903417e+02| 0:0:00|5.6e+00|1.4e+00|1.8e-05| ↙
chol 1  1
13|1.000|1.000|5.4e-06|1.1e-04|5.4e+02| 1.058192e+02| 0:0:00|2.3e+00|1.4e+00|6.7e-06| ↙
chol 1  1
14|1.000|1.000|2.2e-06|7.2e-05|2.1e+02| 1.977316e+01| 0:0:00|7.7e-01|1.5e+00|3.0e-06| ↙
chol 1  1
15|1.000|1.000|7.5e-07|5.7e-05|6.4e+01|-2.078061e+01| 0:0:00|3.1e-01|1.7e+00|1.1e-06| ↙
chol 1  1
16|1.000|1.000|2.8e-07|5.0e-05|2.2e+01|-3.241203e+01| 0:0:00|1.0e-01|1.8e+00|4.4e-07| ↙
chol 1  1
17|1.000|1.000|6.3e-08|4.5e-05|4.6e+00|-3.795496e+01| 0:0:00|4.2e-02|1.9e+00|1.1e-07| ↙
chol 1  1
18|1.000|1.000|2.3e-08|4.0e-05|1.6e+00|-3.890081e+01| 0:0:00|1.0e-02|1.9e+00|3.8e-08| ↙
chol 1  1
19|0.987|0.987|4.4e-09|3.6e-05|3.1e-01|-3.934201e+01| 0:0:00|3.8e-03|2.0e+00|7.5e-09| ↙
chol 1  1
20|1.000|1.000|1.5e-09|1.4e-05|1.1e-01|-3.940771e+01| 0:0:00|7.4e-04|2.0e+00|2.6e-09| ↙
chol 1  1
21|0.975|0.975|3.5e-10|6.1e-06|2.5e-02|-3.943678e+01| 0:0:00|2.6e-04|2.0e+00|6.0e-10| ↙
chol 1  1
22|0.989|0.989|1.2e-10|3.0e-07|8.6e-03|-3.944144e+01| 0:0:00|6.1e-05|2.0e+00|2.1e-10| ↙
chol 1  1
23|1.000|1.000|3.2e-11|9.7e-08|2.3e-03|-3.944439e+01| 0:0:00|2.0e-05|2.0e+00|5.5e-11| ↙
chol 1  1
24|1.000|1.000|1.3e-11|9.7e-08|6.3e-04|-3.944512e+01| 0:0:00|5.5e-06|2.0e+00|1.5e-11| ↙
chol 1  1
25|0.977|0.977|2.5e-12|9.7e-08|6.9e-05|-3.944535e+01| 0:0:00|1.6e-06|2.0e+00|1.7e-12| ↙
chol 1  1
26|1.000|1.000|3.8e-12|9.7e-08|1.1e-05|-3.944537e+01| 0:0:00|1.7e-07|2.0e+00|2.7e-13| ↙
chol 1  1
27|1.000|1.000|2.2e-11|9.7e-08|5.9e-07|-3.944538e+01| 0:0:00|2.7e-08|2.0e+00|1.4e-14|
  Stop: max(relative gap,infeasibilities) < 1.00e-07
------------------------------------------------------------------
 number of iterations   = 27
 primal objective value = -3.94453749e+01
 dual   objective value = -3.94453753e+01
 gap := trace(XZ)       = 5.89e-07
 relative gap           = 1.46e-08
 actual relative gap    = 5.67e-09
 rel. primal infeas     = 2.18e-11
 rel. dual   infeas     = 9.66e-08
 norm(X), norm(y), norm(Z) = 9.3e+00, 6.4e+01, 2.7e+01
 norm(A), norm(b), norm(C) = 8.2e+02, 1.9e+02, 7.6e+01
 Total CPU time (secs)  = 0.22
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 2.2e-11  0.0e+00  9.7e-08  0.0e+00  5.7e-09  7.4e-09
------------------------------------------------------------------

ans =
```

```
   39.4454

Iteration   3   Total error is: 0.025595

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.2e+00|1.5e+01|8.1e+07| 7.152162e+05| 0:0:00|8.1e+07|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|1.6e-01|2.1e+00|1.5e+07| 8.304833e+05| 0:0:00|7.3e+06|9.1e-01|1.3e-01| ↙
chol 1  1
 2|1.000|1.000|1.2e-01|1.5e+00|1.9e+07| 1.299460e+06| 0:0:00|2.2e+06|6.4e-01|6.2e-02| ↙
chol 1  1
 3|1.000|1.000|7.0e-02|9.0e-01|1.4e+07| 1.242801e+06| 0:0:00|1.7e+05|5.9e-01|3.5e-02| ↙
chol 1  1
 4|0.725|0.725|3.0e-02|3.9e-01|4.9e+06| 6.951264e+05| 0:0:00|8.9e+03|7.5e-01|1.9e-02| ↙
chol 1  1
 5|1.000|1.000|4.5e-03|5.7e-02|5.8e+05| 1.404451e+05| 0:0:00|7.5e+02|1.1e+00|4.0e-03| ↙
chol 1  1
 6|0.736|0.736|1.5e-03|1.9e-02|1.7e+05| 4.575304e+04| 0:0:00|6.7e+02|1.2e+00|1.5e-03| ↙
chol 1  1
 7|1.000|1.000|1.1e-03|1.4e-02|1.3e+05| 3.275553e+04| 0:0:00|2.4e+02|1.2e+00|1.1e-03| ↙
chol 1  1
 8|1.000|1.000|4.8e-04|6.1e-03|5.4e+04| 1.460455e+04| 0:0:00|1.8e+02|1.2e+00|4.8e-04| ↙
chol 1  1
 9|1.000|1.000|2.0e-04|2.6e-03|2.2e+04| 5.657022e+03| 0:0:00|7.3e+01|1.2e+00|2.1e-04| ↙
chol 1  1
10|1.000|1.000|9.3e-05|1.2e-03|1.0e+04| 2.649336e+03| 0:0:00|3.2e+01|1.3e+00|1.0e-04| ↙
chol 1  1
11|1.000|1.000|3.3e-05|4.5e-04|3.5e+03| 8.607650e+02| 0:0:00|1.4e+01|1.3e+00|3.7e-05| ↙
chol 1  1
12|1.000|1.000|1.4e-05|2.1e-04|1.5e+03| 3.584202e+02| 0:0:00|5.0e+00|1.4e+00|1.7e-05| ↙
chol 1  1
13|1.000|1.000|5.0e-06|1.0e-04|4.8e+02| 9.168702e+01| 0:0:00|2.1e+00|1.4e+00|6.1e-06| ↙
chol 1  1
14|1.000|1.000|2.1e-06|7.0e-05|1.9e+02| 1.500588e+01| 0:0:00|6.8e-01|1.5e+00|2.7e-06| ↙
chol 1  1
15|1.000|1.000|6.8e-07|5.7e-05|5.6e+01|-2.260624e+01| 0:0:00|2.8e-01|1.7e+00|9.7e-07| ↙
chol 1  1
16|1.000|1.000|2.5e-07|5.0e-05|1.9e+01|-3.288739e+01| 0:0:00|9.1e-02|1.8e+00|3.9e-07| ↙
chol 1  1
```

```
17|1.000|1.000|5.3e-08|4.5e-05|3.8e+00|-3.784757e+01| 0:0:00|3.7e-02|1.9e+00|8.6e-08| ↙
chol 1  1
18|1.000|1.000|2.0e-08|4.0e-05|1.4e+00|-3.859199e+01| 0:0:00|8.3e-03|1.9e+00|3.4e-08| ↙
chol 1  1
19|0.974|0.974|3.7e-09|3.6e-05|2.6e-01|-3.898498e+01| 0:0:00|3.4e-03|2.0e+00|6.2e-09| ↙
chol 1  1
20|1.000|1.000|1.1e-09|1.4e-05|8.0e-02|-3.904248e+01| 0:0:00|6.1e-04|2.0e+00|1.9e-09| ↙
chol 1  1
21|0.941|0.941|2.3e-10|1.4e-06|1.6e-02|-3.906393e+01| 0:0:00|2.2e-04|2.0e+00|3.8e-10| ↙
chol 1  1
22|1.000|1.000|1.0e-10|2.4e-07|7.0e-03|-3.906737e+01| 0:0:00|3.8e-05|2.0e+00|1.7e-10| ↙
chol 1  1
23|0.960|0.960|2.3e-11|1.0e-07|1.4e-03|-3.906975e+01| 0:0:00|1.7e-05|2.0e+00|3.5e-11| ↙
chol 1  1
24|0.629|0.629|1.8e-11|9.9e-08|1.2e-03|-3.906989e+01| 0:0:00|8.7e-06|2.0e+00|2.8e-11| ↙
chol 1  1
25|1.000|1.000|9.5e-12|9.7e-08|1.9e-04|-3.907027e+01| 0:0:00|2.7e-06|2.0e+00|4.5e-12| ↙
chol 1  1
26|1.000|1.000|1.8e-11|9.7e-08|4.3e-05|-3.907033e+01| 0:0:00|4.5e-07|2.0e+00|1.0e-12| ↙
chol 1  1
27|1.000|1.000|3.8e-12|9.7e-08|9.8e-06|-3.907034e+01| 0:0:00|1.0e-07|2.0e+00|2.3e-13| ↙
chol 1  1
28|1.000|1.000|3.7e-11|9.7e-08|4.6e-07|-3.907035e+01| 0:0:00|2.3e-08|2.0e+00|8.9e-15|
  Stop: max(relative gap,infeasibilities) < 1.00e-07
------------------------------------------------------------------
 number of iterations   = 28
 primal objective value = -3.90703480e+01
 dual   objective value = -3.90703474e+01
 gap := trace(XZ)       = 4.62e-07
 relative gap           = 1.15e-08
 actual relative gap    = -7.80e-09
 rel. primal infeas     = 3.74e-11
 rel. dual   infeas     = 9.66e-08
 norm(X), norm(y), norm(Z) = 1.5e+01, 6.4e+01, 2.8e+01
 norm(A), norm(b), norm(C) = 8.2e+02, 2.0e+02, 7.6e+01
 Total CPU time (secs)  = 0.22
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 3.7e-11  0.0e+00  9.7e-08  0.0e+00  -7.8e-09  5.8e-09
------------------------------------------------------------------

ans =

   39.0703

Iteration   4   Total error is: 0.02546

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
```

```
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************** ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------- ↙
------
 0|0.000|0.000|1.3e+00|1.5e+01|7.5e+07| 6.652295e+05| 0:0:00|7.5e+07|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|1.9e-01|2.2e+00|1.5e+07| 7.869132e+05| 0:0:00|7.5e+06|9.0e-01|1.3e-01| ↙
chol 1  1
 2|1.000|1.000|1.2e-01|1.5e+00|1.7e+07| 1.174814e+06| 0:0:00|2.1e+06|6.5e-01|6.3e-02| ↙
chol 1  1
 3|0.950|0.950|6.6e-02|7.8e-01|1.0e+07| 9.976714e+05| 0:0:00|1.4e+05|6.5e-01|3.4e-02| ↙
chol 1  1
 4|0.779|0.779|2.8e-02|3.3e-01|3.7e+06| 5.781972e+05| 0:0:00|7.3e+03|7.8e-01|1.7e-02| ↙
chol 1  1
 5|1.000|1.000|3.8e-03|4.5e-02|4.1e+05| 1.023456e+05| 0:0:00|7.2e+02|1.1e+00|3.3e-03| ↙
chol 1  1
 6|0.776|0.776|1.4e-03|1.6e-02|1.4e+05| 3.709881e+04| 0:0:00|5.3e+02|1.2e+00|1.3e-03| ↙
chol 1  1
 7|1.000|1.000|1.0e-03|1.2e-02|1.0e+05| 2.581946e+04| 0:0:00|1.9e+02|1.2e+00|9.4e-04| ↙
chol 1  1
 8|1.000|1.000|5.1e-04|6.1e-03|5.1e+04| 1.370726e+04| 0:0:00|1.4e+02|1.2e+00|4.8e-04| ↙
chol 1  1
 9|1.000|1.000|1.7e-04|2.1e-03|1.6e+04| 4.104516e+03| 0:0:00|6.8e+01|1.2e+00|1.7e-04| ↙
chol 1  1
10|1.000|1.000|9.7e-05|1.2e-03|9.1e+03| 2.378111e+03| 0:0:00|2.3e+01|1.3e+00|9.7e-05| ↙
chol 1  1
11|1.000|1.000|2.8e-05|3.7e-04|2.6e+03| 6.375685e+02| 0:0:00|1.3e+01|1.3e+00|2.9e-05| ↙
chol 1  1
12|1.000|1.000|1.4e-05|2.0e-04|1.2e+03| 2.984840e+02| 0:0:00|3.6e+00|1.4e+00|1.5e-05| ↙
chol 1  1
13|1.000|1.000|4.4e-06|9.3e-05|3.7e+02| 6.155480e+01| 0:0:00|1.8e+00|1.4e+00|5.1e-06| ↙
chol 1  1
14|1.000|1.000|1.9e-06|6.8e-05|1.5e+02| 4.314081e+00| 0:0:00|4.9e-01|1.6e+00|2.4e-06| ↙
chol 1  1
15|1.000|1.000|5.8e-07|5.6e-05|4.0e+01|-2.666740e+01| 0:0:00|2.3e-01|1.7e+00|7.9e-07| ↙
chol 1  1
16|1.000|1.000|2.2e-07|5.0e-05|1.4e+01|-3.425701e+01| 0:0:00|6.6e-02|1.8e+00|3.1e-07| ↙
chol 1  1
17|1.000|1.000|4.1e-08|4.5e-05|2.5e+00|-3.800300e+01| 0:0:00|2.8e-02|1.9e+00|6.2e-08| ↙
chol 1  1
18|1.000|1.000|1.7e-08|4.0e-05|1.0e+00|-3.847353e+01| 0:0:00|5.6e-03|1.9e+00|2.6e-08| ↙
chol 1  1
19|0.967|0.967|3.0e-09|3.6e-05|1.8e-01|-3.875727e+01| 0:0:00|2.5e-03|2.0e+00|4.6e-09| ↙
chol 1  1
20|0.960|0.960|5.7e-10|2.8e-06|3.4e-02|-3.880273e+01| 0:0:00|5.1e-04|2.0e+00|8.9e-10| ↙
chol 1  1
21|1.000|1.000|2.5e-10|5.9e-07|1.5e-02|-3.881059e+01| 0:0:00|8.2e-05|2.0e+00|3.8e-10| ↙
chol 1  1
22|1.000|1.000|5.2e-11|2.4e-07|3.1e-03|-3.881549e+01| 0:0:00|3.5e-05|2.0e+00|8.1e-11| ↙
chol 1  1
23|0.760|0.760|3.8e-11|2.4e-07|2.3e-03|-3.881587e+01| 0:0:00|1.4e-05|2.0e+00|5.9e-11| ↙
```

```
chol 1  1
24|0.949|0.949|2.3e-11|2.4e-07|3.7e-04|-3.881661e+01| 0:0:00|5.8e-06|2.0e+00|9.6e-12| ↙
chol 1  1
25|0.954|0.954|1.2e-11|2.4e-07|1.5e-04|-3.881669e+01| 0:0:00|1.1e-06|2.0e+00|4.0e-12| ↙
chol 1  1
26|1.000|1.000|4.2e-11|2.4e-07|1.7e-05|-3.881675e+01| 0:0:00|3.7e-07|2.0e+00|4.5e-13| ↙
chol 1  1
27|1.000|1.000|3.5e-11|2.4e-07|5.4e-07|-3.881675e+01| 0:0:00|4.2e-08|2.0e+00|1.3e-14| ↙
chol 1  1
28|1.000|1.000|1.1e-10|2.4e-07|6.7e-09|-3.881675e+01| 0:0:00|1.3e-09|2.0e+00|0.0e+00| ↙
chol 1  1
29|1.000|1.000|1.6e-11|2.4e-07|1.1e-10|-3.881675e+01| 0:0:00|1.8e-11|2.0e+00|0.0e+00| ↙
chol 1  1
30|0.961|0.961|7.4e-11|2.4e-07|6.1e-11|-3.881675e+01| 0:0:00|9.6e-13|2.0e+00|0.0e+00|
  lack of progess in infeas
-----------------------------------------------------------------
 number of iterations   = 30
 primal objective value = -3.88167552e+01
 dual   objective value = -3.88167524e+01
 gap := trace(XZ)       = 5.43e-07
 relative gap           = 1.36e-08
 actual relative gap    = -3.57e-08
 rel. primal infeas     = 3.52e-11
 rel. dual   infeas     = 2.37e-07
 norm(X), norm(y), norm(Z) = 2.8e+01, 6.5e+01, 2.8e+01
 norm(A), norm(b), norm(C) = 8.2e+02, 2.0e+02, 7.6e+01
 Total CPU time (secs)  = 0.23
 CPU time per iteration = 0.01
 termination code       = -9
 DIMACS errors: 3.5e-11  0.0e+00  2.4e-07  0.0e+00  -3.6e-08  6.9e-09
-----------------------------------------------------------------

ans =

   38.8168

Iteration   5   Total error is: 0.025369

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------- ↙
------
 0|0.000|0.000|1.6e+00|1.5e+01|5.9e+07| 5.215640e+05| 0:0:00|5.9e+07|1.0e+00|1.0e+00| ↙
```

```
chol 1  1
 1|1.000|1.000|2.3e-01|2.1e+00|1.1e+07| 6.089037e+05| 0:0:00|5.5e+06|9.1e-01|1.3e-01| ↙
chol 1  1
 2|1.000|1.000|1.5e-01|1.3e+00|1.2e+07| 8.797765e+05| 0:0:00|1.5e+06|6.7e-01|5.9e-02| ↙
chol 1  1
 3|0.911|0.911|7.4e-02|6.8e-01|6.4e+06| 6.833076e+05| 0:0:00|9.1e+04|6.9e-01|3.1e-02| ↙
chol 1  1
 4|0.799|0.799|3.0e-02|2.7e-01|2.3e+06| 3.856435e+05| 0:0:00|4.7e+03|8.2e-01|1.5e-02| ↙
chol 1  1
 5|1.000|1.000|3.0e-03|2.8e-02|1.9e+05| 4.797628e+04| 0:0:00|6.1e+02|1.1e+00|2.1e-03| ↙
chol 1  1
 6|0.930|0.930|1.4e-03|1.3e-02|8.4e+04| 2.250628e+04| 0:0:00|2.6e+02|1.2e+00|9.8e-04| ↙
chol 1  1
 7|1.000|1.000|8.8e-04|8.1e-03|5.3e+04| 1.383598e+04| 0:0:00|1.2e+02|1.2e+00|6.4e-04| ↙
chol 1  1
 8|1.000|1.000|4.1e-04|3.9e-03|2.4e+04| 6.460032e+03| 0:0:00|7.4e+01|1.2e+00|3.0e-04| ↙
chol 1  1
 9|1.000|1.000|1.6e-04|1.5e-03|9.1e+03| 2.312509e+03| 0:0:00|3.3e+01|1.2e+00|1.2e-04| ↙
chol 1  1
10|1.000|1.000|7.3e-05|7.1e-04|4.1e+03| 1.072280e+03| 0:0:00|1.3e+01|1.3e+00|5.7e-05| ↙
chol 1  1
11|1.000|1.000|2.5e-05|2.7e-04|1.4e+03| 3.267535e+02| 0:0:00|5.9e+00|1.3e+00|2.0e-05| ↙
chol 1  1
12|1.000|1.000|1.1e-05|1.4e-04|5.7e+02| 1.224185e+02| 0:0:00|1.9e+00|1.4e+00|9.4e-06| ↙
chol 1  1
13|1.000|1.000|3.7e-06|8.1e-05|1.8e+02| 1.264043e+01| 0:0:00|8.3e-01|1.5e+00|3.4e-06| ↙
chol 1  1
14|1.000|1.000|1.5e-06|6.5e-05|6.7e+01|-1.795994e+01| 0:0:00|2.5e-01|1.6e+00|1.5e-06| ↙
chol 1  1
15|1.000|1.000|4.3e-07|5.6e-05|1.7e+01|-3.326373e+01| 0:0:00|1.1e-01|1.8e+00|4.7e-07| ↙
chol 1  1
16|1.000|1.000|1.4e-07|5.0e-05|5.3e+00|-3.684159e+01| 0:0:00|3.1e-02|1.9e+00|1.6e-07| ↙
chol 1  1
17|0.980|0.980|2.5e-08|4.5e-05|9.2e-01|-3.832296e+01| 0:0:00|1.2e-02|1.9e+00|3.0e-08| ↙
chol 1  1
18|1.000|1.000|9.7e-09|4.0e-05|3.6e-01|-3.850854e+01| 0:0:00|2.1e-03|2.0e+00|1.2e-08| ↙
chol 1  1
19|0.926|0.926|2.0e-09|1.8e-05|7.1e-02|-3.860560e+01| 0:0:00|9.3e-04|2.0e+00|2.4e-09| ↙
chol 1  1
20|1.000|1.000|8.2e-10|6.5e-06|3.0e-02|-3.861782e+01| 0:0:00|1.7e-04|2.0e+00|9.8e-10| ↙
chol 1  1
21|0.991|0.991|1.5e-10|2.7e-06|5.3e-03|-3.862691e+01| 0:0:00|7.2e-05|2.0e+00|1.7e-10| ↙
chol 1  1
22|0.960|0.960|2.2e-11|2.1e-07|7.8e-04|-3.862842e+01| 0:0:00|1.5e-05|2.0e+00|2.6e-11| ↙
chol 1  1
23|0.656|0.656|1.7e-11|1.4e-07|5.8e-04|-3.862851e+01| 0:0:00|6.4e-06|2.0e+00|1.9e-11| ↙
chol 1  1
24|0.968|0.968|1.0e-10|1.1e-07|9.3e-05|-3.862871e+01| 0:0:00|1.5e-06|2.0e+00|3.1e-12| ↙
chol 1  1
25|1.000|1.000|1.8e-10|1.1e-07|3.2e-05|-3.862874e+01| 0:0:00|2.2e-07|2.0e+00|1.0e-12| ↙
chol 1  1
26|0.933|0.933|2.7e-11|1.1e-07|9.9e-06|-3.862874e+01| 0:0:00|8.6e-08|2.0e+00|3.2e-13| ↙
chol 1  1
27|1.000|1.000|4.6e-10|1.1e-07|3.6e-06|-3.862875e+01| 0:0:00|2.4e-08|2.0e+00|1.1e-13| ↙
chol 1  1
```

```
28|1.000|1.000|1.2e-10|1.1e-07|6.5e-07|-3.862875e+01| 0:0:00|8.5e-09|2.0e+00|1.6e-14| ↙
chol 1  1
29|1.000|1.000|1.1e-10|1.1e-07|1.5e-07|-3.862875e+01| 0:0:00|1.5e-09|2.0e+00|6.1e-16| ↙
chol 1  1
30|1.000|1.000|8.7e-11|1.1e-07|2.8e-08|-3.862875e+01| 0:0:00|3.6e-10|2.0e+00|0.0e+00|
  lack of progess in infeas
-----------------------------------------------------------------
 number of iterations   = 30
 primal objective value = -3.86287468e+01
 dual   objective value = -3.86287477e+01
 gap := trace(XZ)       = 3.58e-06
 relative gap           = 9.03e-08
 actual relative gap    = 1.11e-08
 rel. primal infeas     = 4.61e-10
 rel. dual   infeas     = 1.07e-07
 norm(X), norm(y), norm(Z) = 2.7e+01, 6.5e+01, 2.8e+01
 norm(A), norm(b), norm(C) = 8.3e+02, 2.0e+02, 7.6e+01
 Total CPU time (secs)  = 0.26
 CPU time per iteration = 0.01
 termination code       = -9
 DIMACS errors: 4.6e-10  0.0e+00  1.1e-07  0.0e+00  1.1e-08  4.6e-08
-----------------------------------------------------------------

ans =

   38.6287

Iteration   6   Total error is: 0.0253

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.6e+00|1.5e+01|6.4e+07| 5.707376e+05| 0:0:00|6.4e+07|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|3.5e-01|3.4e+00|2.1e+07| 7.589372e+05| 0:0:00|1.0e+07|8.5e-01|1.9e-01| ↙
chol 1  1
 2|0.925|0.925|1.1e-01|1.0e+00|8.1e+06| 7.387427e+05| 0:0:00|1.3e+06|8.0e-01|5.6e-02| ↙
chol 1  1
 3|0.700|0.700|9.1e-02|8.8e-01|9.1e+06| 8.601716e+05| 0:0:00|6.1e+05|6.7e-01|3.9e-02| ↙
chol 1  1
 4|0.927|0.927|5.5e-02|5.3e-01|5.9e+06| 7.146211e+05| 0:0:00|4.6e+04|6.8e-01|2.4e-02| ↙
chol 1  1
```

```
 5|0.786|0.786|2.2e-02|2.1e-01|2.0e+06| 3.621296e+05| 0:0:00|2.3e+03|8.4e-01|1.2e-02| ↙
chol 1  1
 6|0.976|0.976|1.6e-03|1.6e-02|1.1e+05| 2.633345e+04| 0:0:00|1.2e+03|1.1e+00|1.2e-03| ↙
chol 1  1
 7|0.941|0.941|9.4e-04|9.0e-03|6.5e+04| 1.698273e+04| 0:0:00|1.8e+02|1.2e+00|7.0e-04| ↙
chol 1  1
 8|1.000|1.000|5.0e-04|5.0e-03|3.4e+04| 8.996995e+03| 0:0:00|8.9e+01|1.2e+00|3.8e-04| ↙
chol 1  1
 9|1.000|1.000|1.7e-04|1.8e-03|1.2e+04| 3.023838e+03| 0:0:00|4.7e+01|1.2e+00|1.4e-04| ↙
chol 1  1
10|1.000|1.000|8.1e-05|8.3e-04|5.3e+03| 1.358725e+03| 0:0:00|1.6e+01|1.3e+00|6.6e-05| ↙
chol 1  1
11|1.000|1.000|2.8e-05|3.0e-04|1.7e+03| 4.278508e+02| 0:0:00|7.6e+00|1.3e+00|2.3e-05| ↙
chol 1  1
12|1.000|1.000|1.2e-05|1.5e-04|7.0e+02| 1.544661e+02| 0:0:00|2.4e+00|1.4e+00|1.0e-05| ↙
chol 1  1
13|1.000|1.000|4.1e-06|8.4e-05|2.3e+02| 2.665349e+01| 0:0:00|1.0e+00|1.5e+00|3.9e-06| ↙
chol 1  1
14|1.000|1.000|1.6e-06|6.5e-05|8.1e+01|-1.421503e+01| 0:0:00|3.2e-01|1.6e+00|1.6e-06| ↙
chol 1  1
15|1.000|1.000|4.9e-07|5.6e-05|2.3e+01|-3.136388e+01| 0:0:00|1.3e-01|1.8e+00|5.5e-07| ↙
chol 1  1
16|1.000|1.000|1.3e-07|5.0e-05|5.8e+00|-3.657428e+01| 0:0:00|4.0e-02|1.9e+00|1.6e-07| ↙
chol 1  1
17|1.000|1.000|2.8e-08|4.5e-05|1.2e+00|-3.808633e+01| 0:0:00|1.2e-02|1.9e+00|3.5e-08| ↙
chol 1  1
18|1.000|1.000|8.1e-09|4.0e-05|3.4e-01|-3.837508e+01| 0:0:00|2.7e-03|2.0e+00|1.0e-08| ↙
chol 1  1
19|0.983|0.983|1.9e-09|1.7e-05|8.1e-02|-3.846177e+01| 0:0:00|8.3e-04|2.0e+00|2.4e-09| ↙
chol 1  1
20|1.000|1.000|8.4e-10|6.5e-06|3.5e-02|-3.847629e+01| 0:0:00|1.9e-04|2.0e+00|1.0e-09| ↙
chol 1  1
21|1.000|1.000|2.5e-10|2.6e-06|1.1e-02|-3.848518e+01| 0:0:00|8.3e-05|2.0e+00|3.2e-10| ↙
chol 1  1
22|0.943|0.943|4.6e-11|2.5e-07|1.9e-03|-3.848829e+01| 0:0:00|2.8e-05|2.0e+00|5.6e-11| ↙
chol 1  1
23|1.000|1.000|1.9e-11|1.1e-07|7.7e-04|-3.848874e+01| 0:0:00|4.5e-06|2.0e+00|2.3e-11| ↙
chol 1  1
24|1.000|1.000|8.3e-12|1.1e-07|2.9e-04|-3.848895e+01| 0:0:00|1.8e-06|2.0e+00|8.6e-12| ↙
chol 1  1
25|1.000|1.000|1.8e-11|1.1e-07|1.3e-04|-3.848901e+01| 0:0:00|6.8e-07|2.0e+00|3.8e-12| ↙
chol 1  1
26|1.000|1.000|4.9e-11|1.1e-07|4.0e-05|-3.848904e+01| 0:0:00|3.0e-07|2.0e+00|1.2e-12| ↙
chol 1  1
27|1.000|1.000|6.0e-11|1.1e-07|6.4e-06|-3.848906e+01| 0:0:00|9.6e-08|2.0e+00|1.9e-13| ↙
chol 1  1
28|1.000|1.000|1.2e-10|1.1e-07|2.2e-07|-3.848906e+01| 0:0:00|1.5e-08|2.0e+00|4.1e-15|
  Stop: relative gap < infeasibility
-----------------------------------------------------------------
 number of iterations   = 28
 primal objective value = -3.84890608e+01
 dual   objective value = -3.84890604e+01
 gap := trace(XZ)       = 2.23e-07
 relative gap           = 5.65e-09
 actual relative gap    = -6.04e-09
```

```
 rel. primal infeas     = 1.21e-10
 rel. dual   infeas     = 1.07e-07
 norm(X), norm(y), norm(Z) = 1.3e+01, 6.5e+01, 2.8e+01
 norm(A), norm(b), norm(C) = 8.3e+02, 2.1e+02, 7.6e+01
 Total CPU time (secs)  = 0.22
 CPU time per iteration = 0.01
 termination code       = -1
 DIMACS errors: 1.2e-10  0.0e+00  1.1e-07  0.0e+00  -6.0e-09  2.9e-09
------------------------------------------------------------------

ans =

   38.4891

Iteration   7   Total error is: 0.025245

 num. of constraints = 25
 dim. of socp   var  = 26,   num. of socp blk  =  1
 dim. of linear var  = 800
 2 linear variables from unrestricted variable.

 *** convert ublk to linear blk
********************************************************************************* ↙
******
   SDPT3: homogeneous self-dual path-following algorithms
********************************************************************************* ↙
******
 version  predcorr  gam  expon
   HKM      1      0.000   1
it pstep dstep pinfeas dinfeas  gap     mean(obj)    cputime    kap   tau    theta
------------------------------------------------------------------------------------ ↙
------
 0|0.000|0.000|1.5e+00|1.5e+01|7.2e+07| 6.349341e+05| 0:0:00|7.2e+07|1.0e+00|1.0e+00| ↙
chol 1  1
 1|1.000|1.000|4.0e-01|4.1e+00|3.0e+07| 9.047332e+05| 0:0:00|1.3e+07|8.2e-01|2.2e-01| ↙
chol 1  1
 2|0.797|0.797|1.2e-01|1.2e+00|9.1e+06| 7.651215e+05| 0:0:00|2.2e+06|8.5e-01|6.7e-02| ↙
chol 1  1
 3|0.584|0.584|1.1e-01|1.1e+00|1.2e+07| 9.591257e+05| 0:0:00|1.3e+06|6.9e-01|5.0e-02| ↙
chol 1  1
 4|0.925|0.925|8.1e-02|8.2e-01|1.1e+07| 1.059251e+06| 0:0:00|2.9e+05|6.0e-01|3.3e-02| ↙
chol 1  1
 5|0.781|0.781|4.2e-02|4.3e-01|5.1e+06| 6.842093e+05| 0:0:00|1.9e+04|7.1e-01|2.0e-02| ↙
chol 1  1
 6|0.745|0.745|1.1e-02|1.1e-01|9.6e+05| 1.948610e+05| 0:0:00|6.8e+02|9.8e-01|7.3e-03| ↙
chol 1  1
 7|0.825|0.825|1.8e-03|1.8e-02|1.3e+05| 2.996978e+04| 0:0:00|9.3e+02|1.2e+00|1.4e-03| ↙
chol 1  1
 8|1.000|1.000|1.2e-03|1.2e-02|1.0e+05| 2.529774e+04| 0:0:00|1.8e+02|1.2e+00|9.6e-04| ↙
chol 1  1
 9|1.000|1.000|5.5e-04|5.6e-03|4.5e+04| 1.201815e+04| 0:0:00|1.4e+02|1.2e+00|4.5e-04| ↙
chol 1  1
10|1.000|1.000|2.1e-04|2.3e-03|1.7e+04| 4.312269e+03| 0:0:00|6.0e+01|1.2e+00|1.8e-04| ↙
chol 1  1
11|1.000|1.000|1.1e-04|1.1e-03|8.2e+03| 2.159824e+03| 0:0:00|2.4e+01|1.3e+00|9.1e-05| ↙
```

```
chol 1  1
12|1.000|1.000|3.6e-05|4.0e-04|2.7e+03| 6.634183e+02| 0:0:00|1.2e+01|1.3e+00|3.2e-05| ↙
chol 1  1
13|1.000|1.000|1.6e-05|1.9e-04|1.2e+03| 2.836230e+02| 0:0:00|3.8e+00|1.4e+00|1.5e-05| ↙
chol 1  1
14|1.000|1.000|5.5e-06|9.0e-05|3.7e+02| 6.446975e+01| 0:0:00|1.7e+00|1.4e+00|5.3e-06| ↙
chol 1  1
15|1.000|1.000|2.3e-06|6.3e-05|1.5e+02| 4.678972e+00| 0:0:00|5.2e-01|1.5e+00|2.4e-06| ↙
chol 1  1
16|1.000|1.000|7.2e-07|5.1e-05|4.1e+01|-2.592185e+01| 0:0:00|2.2e-01|1.7e+00|8.2e-07| ↙
chol 1  1
17|1.000|1.000|2.7e-07|4.5e-05|1.4e+01|-3.366602e+01| 0:0:00|6.6e-02|1.8e+00|3.3e-07| ↙
chol 1  1
18|1.000|1.000|5.1e-08|4.0e-05|2.6e+00|-3.753024e+01| 0:0:00|2.8e-02|1.9e+00|6.6e-08| ↙
chol 1  1
19|1.000|1.000|2.1e-08|3.6e-05|1.0e+00|-3.802519e+01| 0:0:00|5.6e-03|1.9e+00|2.7e-08| ↙
chol 1  1
20|0.968|0.968|3.8e-09|3.3e-05|1.9e-01|-3.830906e+01| 0:0:00|2.5e-03|2.0e+00|5.0e-09| ↙
chol 1  1
21|1.000|1.000|1.3e-09|1.3e-05|6.4e-02|-3.834876e+01| 0:0:00|4.4e-04|2.0e+00|1.7e-09| ↙
chol 1  1
22|1.000|1.000|3.9e-10|5.3e-06|1.9e-02|-3.836488e+01| 0:0:00|1.5e-04|2.0e+00|5.2e-10| ↙
chol 1  1
23|0.997|0.997|9.9e-11|2.3e-07|4.9e-03|-3.836955e+01| 0:0:00|4.6e-05|2.0e+00|1.3e-10| ↙
chol 1  1
24|1.000|1.000|3.3e-11|8.7e-08|1.7e-03|-3.837103e+01| 0:0:00|1.2e-05|2.0e+00|4.5e-11| ↙
chol 1  1
25|0.981|0.981|1.1e-11|8.7e-08|3.9e-04|-3.837156e+01| 0:0:00|4.1e-06|2.0e+00|1.1e-11| ↙
chol 1  1
26|0.773|0.773|1.4e-11|8.7e-08|2.9e-04|-3.837161e+01| 0:0:00|1.7e-06|2.0e+00|7.7e-12| ↙
chol 1  1
27|0.952|0.952|5.7e-12|8.7e-08|3.7e-05|-3.837171e+01| 0:0:00|7.3e-07|2.0e+00|1.0e-12| ↙
chol 1  1
28|1.000|1.000|5.3e-12|8.7e-08|1.6e-05|-3.837172e+01| 0:0:00|8.9e-08|2.0e+00|4.4e-13| ↙
chol 1  1
29|1.000|1.000|1.0e-10|8.7e-08|2.3e-06|-3.837172e+01| 0:0:00|3.9e-08|2.0e+00|5.9e-14|
  Stop: max(relative gap,infeasibilities) < 1.00e-07
------------------------------------------------------------------
 number of iterations   = 29
 primal objective value = -3.83717206e+01
 dual   objective value = -3.83717220e+01
 gap := trace(XZ)       = 2.31e-06
 relative gap           = 5.87e-08
 actual relative gap    = 1.82e-08
 rel. primal infeas     = 1.05e-10
 rel. dual   infeas     = 8.69e-08
 norm(X), norm(y), norm(Z) = 1.1e+01, 6.5e+01, 2.8e+01
 norm(A), norm(b), norm(C) = 8.3e+02, 2.2e+02, 7.6e+01
 Total CPU time (secs)  = 0.23
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS errors: 1.0e-10  0.0e+00  8.7e-08  0.0e+00  1.8e-08  3.0e-08
------------------------------------------------------------------

ans =
```

```
   38.3717

Iteration   8   Total error is: 0.025198
The total representation error of the testing signals is: 0.24925
>>
```