

```
>> demo_Polynomial_Dictionary_Learning_Uber
```

```
Starting to train the dictionary
```

```
solving the quadratic problem with YALMIP...
```

```
num. of constraints = 21
dim. of socp var = 22, num. of socp blk = 1
dim. of linear var = 116
8 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|1.8e+00|3.6e+00|2.5e+04| 5.337612e+02| 0:0:00|2.5e+04|1.0e+00|1.0e+00| ✓
chol 1 1
1|0.907|0.907|1.7e-01|3.2e-01|2.8e+03| 4.182407e+02| 0:0:00|3.6e+02|1.1e+00|9.9e-02| ✓
chol 1 1
2|0.764|0.764|3.8e-02|7.4e-02|4.8e+02| 8.419874e+01| 0:0:00|1.0e+01|1.4e+00|2.8e-02| ✓
chol 1 1
3|0.862|0.862|5.8e-03|1.1e-02|7.3e+01|-1.921734e+01| 0:0:00|4.3e+00|1.5e+00|4.8e-03| ✓
chol 1 1
4|0.677|0.677|4.9e-03|9.5e-03|9.4e+01|-1.441484e+01| 0:0:00|2.9e+00|1.2e+00|3.2e-03| ✓
chol 1 1
5|1.000|1.000|1.9e-03|4.3e-03|4.8e+01|-2.773812e+01| 0:0:00|8.9e-01|1.2e+00|1.3e-03| ✓
chol 1 1
6|1.000|1.000|2.0e-04|5.0e-04|4.6e+00|-3.903151e+01| 0:0:00|3.6e-01|1.3e+00|1.4e-04| ✓
chol 1 1
7|0.908|0.908|1.1e-04|3.1e-04|2.4e+00|-3.913863e+01| 0:0:00|2.5e-02|1.5e+00|8.8e-05| ✓
chol 1 1
8|0.966|0.966|1.7e-05|1.6e-04|3.9e-01|-3.967583e+01| 0:0:00|2.3e-02|1.6e+00|1.5e-05| ✓
chol 1 1
9|1.000|1.000|6.0e-06|6.1e-05|1.2e-01|-3.973622e+01| 0:0:00|3.6e-03|1.6e+00|5.2e-06| ✓
chol 1 1
10|0.808|0.808|1.7e-06|3.1e-05|2.9e-02|-3.976052e+01| 0:0:00|1.7e-03|1.7e+00|1.5e-06| ✓
chol 1 1
11|1.000|1.000|7.3e-07|9.7e-06|1.5e-02|-3.976362e+01| 0:0:00|3.4e-04|1.7e+00|6.8e-07| ✓
chol 1 1
12|0.928|0.928|1.8e-07|4.3e-06|3.7e-03|-3.976647e+01| 0:0:00|1.9e-04|1.8e+00|1.7e-07| ✓
chol 1 1
13|1.000|1.000|9.1e-08|1.5e-06|2.0e-03|-3.976684e+01| 0:0:00|4.9e-05|1.8e+00|8.7e-08| ✓
chol 1 1
14|0.990|0.990|5.7e-09|6.2e-07|3.5e-04|-3.976726e+01| 0:0:00|2.5e-05|1.8e+00|5.5e-09| ✓
chol 1 1
15|1.000|1.000|5.3e-09|2.4e-07|1.3e-04|-3.976731e+01| 0:0:00|4.7e-06|1.8e+00|0.0e+00| ✓
chol 1 1
16|0.962|0.962|7.3e-09|2.4e-07|1.1e-05|-3.976734e+01| 0:0:00|1.5e-06|1.9e+00|0.0e+00| ✓
chol 1 1
17|1.000|1.000|1.2e-08|2.4e-07|1.6e-06|-3.976734e+01| 0:0:00|1.5e-07|1.9e+00|0.0e+00| ✓
```

```

chol 1 1
18|1.000|1.000|2.0e-08|2.4e-07|6.5e-08|-3.976735e+01| 0:0:00|2.3e-08|1.9e+00|0.0e+00| ✓
chol 1 1
19|1.000|1.000|3.6e-08|2.4e-07|5.1e-09|-3.976735e+01| 0:0:00|1.1e-09|1.9e+00|0.0e+00|
    lack of progress in infeas
-----
number of iterations      = 19
primal objective value = -3.97674218e+01
dual   objective value = -3.97672596e+01
gap := trace(XZ)         = 1.13e-05
relative gap              = 2.78e-07
actual relative gap       = -2.01e-06
rel. primal infeas        = 7.27e-09
rel. dual   infeas        = 2.39e-07
norm(X), norm(y), norm(Z) = 7.5e+00, 5.0e+10, 7.7e+00
norm(A), norm(b), norm(C) = 1.6e+02, 1.0e+00, 5.7e+01
Total CPU time (secs)    = 0.16
CPU time per iteration   = 0.01
termination code         = -9
DIMACS errors: 7.3e-09  0.0e+00  2.4e-07  0.0e+00  -2.0e-06  1.4e-07
-----

ans =

    39.7673

num. of constraints = 21
dim. of socp var   = 22,   num. of socp blk = 1
dim. of linear var = 116
8 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|2.2e+06|3.2e+12| 7.974528e+10| 0:0:00|3.2e+13|1.0e+00|1.0e+00| ✓
chol 1 1
1|0.954|0.954|5.2e-02|1.2e+05|2.8e+11| 6.812986e+10| 0:0:00|1.4e+12|1.0e+00|5.3e-02| ✓
chol 3 3
2|0.136|0.136|4.6e-02|1.0e+05|2.7e+11| 6.813829e+10| 0:0:00|1.2e+12|1.0e+00|4.7e-02| ✓
chol 2 2
3|0.933|0.933|3.5e-03|7.8e+03|3.4e+10| 1.476747e+10| 0:0:00|3.2e+10|1.1e+00|3.7e-03| ✓
chol 1 1
4|0.986|0.986|6.6e-05|1.5e+02|5.5e+08| 2.301935e+08| 0:0:00|4.1e+08|1.1e+00|7.0e-05| ✓
chol 1 1
5|0.932|0.932|5.1e-06|1.1e+01|5.1e+07| 2.052488e+07| 0:0:00|3.4e+07|1.1e+00|5.5e-06| ✓
chol

```

```

SMW too ill-conditioned, switch to LU factor, 1.9e+30.
switch to LU factor lu 1 1
6|0.408|0.408|3.6e-06|8.0e+00|5.0e+07| 1.962045e+07| 0:0:00|2.0e+07|1.1e+00|3.8e-06| ✓
lu 1 1
7|0.907|0.907|9.2e-07|2.1e+00|2.3e+07| 9.093295e+06| 0:0:00|2.4e+06|1.1e+00|9.9e-07| ✓
lu 1 1
8|0.346|0.346|8.0e-07|1.8e+00|2.2e+07| 8.162078e+06| 0:0:00|1.7e+06|1.0e+00|8.3e-07| ✓
lu 1 1
9|1.000|1.000|3.4e-07|7.5e-01|1.1e+07| 3.796180e+06| 0:0:00|1.9e+05|1.0e+00|3.5e-07| ✓
lu 1 2
10|1.000|1.000|1.6e-07|3.5e-01|5.5e+06| 1.529874e+06| 0:0:00|9.2e+04|1.0e+00|1.6e-07| ✓
lu 1 1
11|0.938|0.938|1.8e-08|4.1e-02|6.0e+05| 1.202237e+05| 0:0:00|4.4e+04|1.0e+00|1.8e-08| ✓
lu 1 1
12|0.895|0.895|6.7e-09|1.5e-02|2.2e+05| 6.588699e+04| 0:0:00|6.5e+03|1.0e+00|7.0e-09| ✓
lu 2 2
13|0.956|0.956|3.4e-09|7.6e-03|1.1e+05| 2.947949e+04| 0:0:00|1.7e+03|1.1e+00|3.7e-09| ✓
lu 1 1
14|0.988|0.988|1.3e-09|2.9e-03|4.2e+04| 1.398487e+04| 0:0:00|8.9e+02|1.1e+00|1.4e-09| ✓
lu 1 1
15|1.000|1.000|3.2e-10|7.2e-04|1.0e+04| 3.370873e+03| 0:0:00|3.4e+02|1.1e+00|3.4e-10| ✓
lu 1 2
16|1.000|1.000|1.3e-10|3.0e-04|4.5e+03| 1.511762e+03| 0:0:00|9.5e+01|1.0e+00|1.4e-10| ✓
lu 1 1
17|1.000|1.000|3.3e-11|7.2e-05|1.1e+03| 3.559737e+02| 0:0:00|3.6e+01|1.0e+00|3.3e-11| ✓
lu 1 1
18|1.000|1.000|1.4e-11|3.0e-05|4.9e+02| 1.577253e+02| 0:0:00|9.3e+00|9.7e-01|1.3e-11| ✓
lu 2 1
19|1.000|1.000|3.2e-12|7.1e-06|1.1e+02| 3.331967e+01| 0:0:00|3.3e+00|9.8e-01|3.1e-12| ✓
lu 1 1
20|1.000|1.000|1.3e-12|2.9e-06|4.3e+01| 1.390978e+01| 0:0:00|6.5e-01|1.0e+00|1.3e-12| ✓
lu 1 1
21|0.968|0.968|1.6e-13|3.4e-07|4.7e+00| 7.257689e-02| 0:0:00|3.0e-01|1.1e+00|1.7e-13| ✓
lu 1 1
22|0.977|0.977|3.7e-14|2.0e-08|2.5e-01|-1.444077e+00| 0:0:00|4.0e-02|1.1e+00|9.9e-15| ✓
lu 1 1
23|0.987|0.987|9.5e-14|5.2e-10|3.2e-03|-1.540133e+00| 0:0:00|2.7e-03|1.1e+00|0.0e+00| ✓
lu 1 1
24|0.974|0.974|1.0e-11|7.2e-11|8.6e-05|-1.534869e+00| 0:0:00|1.1e-04|1.1e+00|0.0e+00| ✓
lu 1 1
25|0.962|0.962|1.3e-11|7.0e-11|3.6e-06|-1.534701e+00| 0:0:00|5.7e-06|1.1e+00|0.0e+00| ✓
lu 5 16
26|0.998|0.998|1.6e-12|7.0e-11|4.2e-07|-1.534693e+00| 0:0:00|8.2e-08|1.1e+00|0.0e+00| ✓
lu 2 2
27|1.000|1.000|3.1e-11|7.0e-11|7.7e-09|-1.534690e+00| 0:0:00|3.9e-09|1.1e+00|0.0e+00|
Stop: max(relative gap,infeasibilities) < 1.00e-07
-----
number of iterations = 27
primal objective value = -1.53469629e+00
dual objective value = -1.53468336e+00
gap := trace(XZ) = 7.67e-09
relative gap = 3.03e-09
actual relative gap = -3.18e-06
rel. primal infeas = 3.05e-11
rel. dual infeas = 6.99e-11

```

```

norm(X), norm(y), norm(Z) = 3.2e+01, 4.9e+10, 5.6e+01
norm(A), norm(b), norm(C) = 1.3e+08, 2.6e+08, 5.7e+01
Total CPU time (secs) = 0.20
CPU time per iteration = 0.01
termination code = 0
DIMACS errors: 3.1e-11 0.0e+00 7.0e-11 0.0e+00 -3.2e-06 1.9e-09
-----

```

```
ans =
```

```
1.5347
```

```
Iteration 2 Total error is: 0.021929
```

```

num. of constraints = 21
dim. of socp var = 22, num. of socp blk = 1
dim. of linear var = 116
8 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|3.6e+06|6.2e+12| 1.550108e+11| 0:0:00|6.2e+13|1.0e+00|1.0e+00| ✓
```

```
chol 1 1
```

```
1|0.945|0.945|6.2e-02|2.2e+05|6.0e+11| 1.335748e+11| 0:0:00|3.4e+12|1.0e+00|6.3e-02| ✓
```

```
chol 2 3
```

```
2|0.103|0.103|5.8e-02|2.1e+05|6.4e+11| 1.438800e+11| 0:0:00|3.1e+12|1.0e+00|5.8e-02| ✓
```

```
chol 1 1
```

```
3|0.934|0.934|4.4e-03|1.6e+04|8.8e+10| 3.736247e+10| 0:0:00|7.6e+10|1.0e+00|4.6e-03| ✓
```

```
chol 2 2
```

```
4|0.981|0.981|1.0e-04|3.6e+02|1.8e+09| 7.676612e+08| 0:0:00|9.8e+08|1.1e+00|1.1e-04| ✓
```

```
chol
```

```
SMW too ill-conditioned, switch to LU factor, 5.6e+31.
```

```
switch to LU factor lu 1 1
```

```
5|0.951|0.951|5.3e-06|1.9e+01|9.4e+07| 3.704415e+07| 0:0:00|6.5e+07|1.1e+00|5.7e-06| ✓
```

```
lu 1 1
```

```
6|0.199|0.199|4.5e-06|1.6e+01|9.2e+07| 3.615785e+07| 0:0:00|5.2e+07|1.1e+00|4.8e-06| ✓
```

```
lu 1 1
```

```
7|0.907|0.907|7.2e-07|2.6e+00|2.7e+07| 1.022860e+07| 0:0:00|5.5e+06|1.1e+00|7.7e-07| ✓
```

```
lu 1 1
```

```
8|0.432|0.432|5.5e-07|2.0e+00|2.4e+07| 9.033903e+06| 0:0:00|3.3e+06|1.1e+00|5.9e-07| ✓
```

```
lu 1 1
```

```
9|1.000|1.000|2.0e-07|7.1e-01|1.2e+07| 4.360186e+06| 0:0:00|2.3e+05|1.1e+00|2.1e-07| ✓
```

```
lu 20 20
```

```
10|0.506|0.506|1.7e-07|6.1e-01|1.1e+07| 3.592502e+06| 0:0:00|1.7e+05|1.0e+00|1.7e-07| ✓
```

```
lu 1 1
```

```
11|0.579|0.579|1.1e-07|4.1e-01|7.4e+06| 2.404225e+06| 0:0:00|1.2e+05|1.0e+00|1.2e-07| ✓
```

```

lu 1 1
12|1.000|1.000|3.7e-08|1.3e-01|2.5e+06| 6.542384e+05| 0:0:00|5.6e+04|1.0e+00|3.7e-08| ✓
lu 1 1
13|0.783|0.783|9.0e-09|3.2e-02|5.6e+05| 1.557152e+05| 0:0:00|2.5e+04|1.0e+00|9.2e-09| ✓
lu 6 3
14|0.915|0.915|4.5e-09|1.6e-02|2.8e+05| 7.097325e+04| 0:0:00|4.9e+03|1.1e+00|4.8e-09| ✓
lu 1 3
15|0.956|0.956|2.0e-09|7.3e-03|1.3e+05| 4.494601e+04| 0:0:00|2.4e+03|1.1e+00|2.2e-09| ✓
lu 1 1
16|0.885|0.885|5.0e-10|1.8e-03|3.2e+04| 1.009121e+04| 0:0:00|1.2e+03|1.1e+00|5.4e-10| ✓
lu 1 1
17|0.965|0.965|2.1e-10|7.5e-04|1.4e+04| 4.484538e+03| 0:0:00|3.1e+02|1.0e+00|2.2e-10| ✓
lu 1 1
18|0.996|0.996|5.3e-11|1.9e-04|3.5e+03| 1.111168e+03| 0:0:00|1.1e+02|1.0e+00|5.4e-11| ✓
lu 1 2
19|1.000|1.000|2.2e-11|7.6e-05|1.5e+03| 4.511313e+02| 0:0:00|3.0e+01|9.8e-01|2.1e-11| ✓
lu 2 1
20|1.000|1.000|5.3e-12|1.9e-05|3.7e+02| 1.087513e+02| 0:0:00|1.0e+01|9.8e-01|5.3e-12| ✓
lu 1 1
21|1.000|1.000|2.1e-12|7.7e-06|1.4e+02| 4.627044e+01| 0:0:00|2.4e+00|1.0e+00|2.2e-12| ✓
lu ^ 2 3
22|0.985|0.985|2.7e-13|1.6e-06|2.7e+01| 7.553307e+00| 0:0:00|9.5e-01|1.1e+00|4.6e-13| ✓
lu 11 3
23|1.000|1.000|1.9e-12|5.3e-07|9.7e+00| 1.640268e+00| 0:0:00|1.9e-01|1.1e+00|1.6e-13| ✓
lu 20 8
24|0.594|0.594|1.4e-11|4.2e-06|1.0e+02|-9.111630e+00| 0:0:00|1.2e-01|1.1e+00|1.3e-12| ✓
lu 1 1
25|0.978|0.978|6.1e-13|1.0e-06|1.8e+01|-3.127617e+00| 0:0:00|8.0e-01|1.1e+00|3.1e-13| ✓
lu 1 1
26|0.967|0.967|8.8e-14|9.8e-08|1.5e+00|-1.177020e+00| 0:0:00|1.6e-01|1.1e+00|3.0e-14| ✓
lu 1 1
27|0.984|0.984|1.2e-15|1.1e-08|2.4e-02|-1.463629e+00| 0:0:00|1.5e-02|1.1e+00|3.4e-15| ✓
lu 1 1
28|0.987|0.987|1.9e-13|9.8e-09|3.5e-04|-1.462402e+00| 0:0:00|4.9e-04|1.1e+00|3.0e-15| ✓
lu 2 2
29|0.682|0.682|9.1e-11|3.2e-09|8.5e-04|-1.518308e+00| 0:0:00|1.6e-04|1.1e+00|9.8e-16| ✓
lu 1 1
30|0.934|0.934|3.0e-11|2.3e-10|8.6e-05|-1.544178e+00| 0:0:00|1.8e-05|1.1e+00|6.8e-17| ✓
lu 9 13
31|0.878|0.878|1.3e-10|8.1e-11|3.7e-05|-1.545643e+00| 0:0:00|2.9e-06|1.1e+00|1.6e-17| ✓
lu 18 6
32|0.972|0.972|7.3e-11|6.3e-11|5.9e-06|-1.546084e+00| 0:0:00|3.9e-07|1.1e+00|0.0e+00| ✓
lu 20 20
33|0.997|0.997|7.0e-12|6.3e-11|1.5e-07|-1.546141e+00| 0:0:00|5.0e-08|1.1e+00|0.0e+00|
Stop: max(relative gap,infeasibilities) < 1.00e-07

```

```

-----
number of iterations    = 33
primal objective value  = -1.54620069e+00
dual   objective value  = -1.54608165e+00
gap := trace(XZ)        = 1.55e-07
relative gap            = 6.08e-08
actual relative gap     = -2.91e-05
rel. primal infeas      = 7.03e-12
rel. dual   infeas      = 6.33e-11
norm(X), norm(y), norm(Z) = 3.6e+02, 4.7e+10, 5.6e+01

```

```

norm(A), norm(b), norm(C) = 2.1e+08, 5.0e+08, 5.7e+01
Total CPU time (secs) = 0.30
CPU time per iteration = 0.01
termination code      = 0
DIMACS errors: 7.0e-12  0.0e+00  6.3e-11  0.0e+00  -2.9e-05  3.8e-08
-----

```

```
ans =
```

```
1.5461
```

```
Iteration 3 Total error is: 0.022006
```

```

num. of constraints = 21
dim. of socp var = 22, num. of socp blk = 1
dim. of linear var = 116
8 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|8.3e+06|1.1e+13| 2.816937e+11| 0:0:00|1.1e+14|1.0e+00|1.0e+00| ✓
chol 1 1
1|0.945|0.945|6.3e-02|5.2e+05|1.1e+12| 2.434171e+11| 0:0:00|6.1e+12|1.0e+00|6.3e-02| ✓
chol 3 3
2|0.119|0.119|5.7e-02|4.8e+05|1.1e+12| 2.570820e+11| 0:0:00|5.5e+12|1.0e+00|5.7e-02| ✓
chol 2 2
3|0.939|0.939|4.0e-03|3.4e+04|1.5e+11| 6.489138e+10| 0:0:00|1.1e+11|1.0e+00|4.2e-03| ✓
chol 2 2
4|0.983|0.983|8.4e-05|7.0e+02|2.8e+09| 1.160980e+09| 0:0:00|1.4e+09|1.1e+00|9.0e-05| ✓
chol
SMW too ill-conditioned, switch to LU factor, 6.4e+31.
switch to LU factor lu 1 1
5|0.964|0.964|3.3e-06|2.8e+01|1.1e+08| 4.061630e+07| 0:0:00|7.8e+07|1.1e+00|3.6e-06| ✓
lu 1 1
6|0.250|0.250|2.7e-06|2.2e+01|1.0e+08| 3.903082e+07| 0:0:00|5.9e+07|1.1e+00|2.9e-06| ✓
lu 1 1
7|0.897|0.897|4.1e-07|3.4e+00|2.5e+07| 9.203850e+06| 0:0:00|6.5e+06|1.1e+00|4.4e-07| ✓
lu 1 1
8|0.458|0.458|3.0e-07|2.5e+00|2.2e+07| 8.233789e+06| 0:0:00|3.7e+06|1.1e+00|3.2e-07| ✓
lu 5 2
9|1.000|1.000|1.1e-07|8.8e-01|1.2e+07| 4.265749e+06| 0:0:00|2.3e+05|1.1e+00|1.1e-07| ✓
lu 1 1
10|0.591|0.591|8.7e-08|7.2e-01|1.0e+07| 3.369411e+06| 0:0:00|1.6e+05|1.0e+00|8.9e-08| ✓
lu 1 1
11|1.000|1.000|2.8e-08|2.3e-01|3.4e+06| 1.114180e+06| 0:0:00|8.1e+04|1.0e+00|2.8e-08| ✓
lu 1 1

```

```

12|0.932|0.932|3.2e-09|2.7e-02|3.8e+05| 1.009167e+05| 0:0:00|2.9e+04|9.9e-01|3.2e-09| ✓
lu 1 1
13|0.856|0.856|1.6e-09|1.3e-02|1.9e+05| 5.156820e+04| 0:0:00|4.9e+03|1.1e+00|1.7e-09| ✓
lu 2 1
14|0.974|0.974|5.6e-10|4.6e-03|6.4e+04| 2.170621e+04| 0:0:00|1.5e+03|1.1e+00|5.8e-10| ✓
lu 2 3
15|0.993|0.993|2.4e-10|1.9e-03|2.8e+04| 8.309431e+03| 0:0:00|5.6e+02|1.0e+00|2.3e-10| ✓
lu 1 1
16|1.000|1.000|6.8e-11|5.6e-04|8.2e+03| 2.718352e+03| 0:0:00|2.2e+02|9.9e-01|6.7e-11| ✓
lu 1 2
17|1.000|1.000|2.6e-11|2.2e-04|3.3e+03| 8.789745e+02| 0:0:00|6.6e+01|9.6e-01|2.5e-11| ✓
lu 1 1
18|1.000|1.000|8.3e-12|7.0e-05|1.1e+03| 3.245449e+02| 0:0:00|2.3e+01|9.6e-01|8.1e-12| ✓
lu 1 1
19|1.000|1.000|2.6e-12|2.2e-05|3.3e+02| 9.114125e+01| 0:0:00|6.8e+00|9.9e-01|2.7e-12| ✓
lu 1 2
20|1.000|1.000|1.0e-12|8.2e-06|1.1e+02| 3.733034e+01| 0:0:00|2.1e+00|1.0e+00|1.0e-12| ✓
lu 2 2
21|0.993|0.993|2.7e-13|1.5e-06|2.0e+01| 4.896247e+00| 0:0:00|8.1e-01|1.1e+00|1.9e-13| ✓
lu 7 5
22|1.000|1.000|3.1e-14|7.6e-07|1.0e+01| 1.746567e+00| 0:0:00|1.5e-01|1.1e+00|9.9e-14| ✓
lu 1 1
23|0.972|0.972|5.1e-14|2.6e-08|2.9e-01|-1.524685e+00| 0:0:00|8.2e-02|1.1e+00|3.5e-15| ✓
lu 1 1
24|0.961|0.961|4.8e-13|1.1e-09|1.2e-02|-1.608336e+00| 0:0:00|6.0e-03|1.1e+00|1.4e-16| ✓
lu 1 1
25|0.972|0.972|5.7e-14|7.8e-11|3.8e-04|-1.610397e+00| 0:0:00|3.0e-04|1.1e+00|0.0e+00| ✓
lu 1 1
26|0.988|0.988|1.2e-12|7.8e-11|4.6e-06|-1.610153e+00| 0:0:00|8.6e-06|1.1e+00|0.0e+00| ✓
lu 8 3
27|0.990|0.990|2.4e-11|7.8e-11|2.4e-07|-1.610131e+00| 0:0:00|1.8e-07|1.1e+00|0.0e+00|
Stop: max(relative gap,infeasibilities) < 1.00e-07

```

```

-----
number of iterations    = 27
primal objective value = -1.61013391e+00
dual   objective value = -1.61012842e+00
gap := trace(XZ)       = 2.41e-07
relative gap           = 9.22e-08
actual relative gap    = -1.30e-06
rel. primal infeas     = 2.43e-11
rel. dual   infeas     = 7.76e-11
norm(X), norm(y), norm(Z) = 4.4e+02, 4.6e+10, 5.6e+01
norm(A), norm(b), norm(C) = 4.9e+08, 9.0e+08, 5.7e+01
Total CPU time (secs)   = 0.22
CPU time per iteration = 0.01
termination code        = 0
DIMACS errors: 2.4e-11  0.0e+00  7.8e-11  0.0e+00  -1.3e-06  5.7e-08
-----

```

ans =

1.6101

Iteration 4 Total error is: 0.022446

```

num. of constraints = 21
dim. of socp var = 22, num. of socp blk = 1
dim. of linear var = 116
8 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|2.2e+07|3.9e+13| 9.618600e+11| 0:0:00|3.9e+14|1.0e+00|1.0e+00| ✓
chol 1 1
1|0.942|0.942|6.5e-02|1.4e+06|3.8e+12| 8.343203e+11| 0:0:00|2.2e+13|1.0e+00|6.6e-02| ✓
chol 2 2
2|0.109|0.109|6.1e-02|1.3e+06|4.2e+12| 9.171983e+11| 0:0:00|2.0e+13|9.9e-01|6.1e-02| ✓
chol 2 2
3|0.937|0.937|4.4e-03|9.6e+04|5.7e+11| 2.431642e+11| 0:0:00|4.1e+11|1.0e+00|4.6e-03| ✓
chol 2 2
4|0.983|0.983|9.5e-05|2.1e+03|1.1e+10| 4.590749e+09| 0:0:00|4.9e+09|1.1e+00|1.0e-04| ✓
chol
SMW too ill-conditioned, switch to LU factor, 5.5e+33.
switch to LU factor lu 1 1
5|0.984|0.984|1.9e-06|4.1e+01|2.1e+08| 6.888891e+07| 0:0:00|1.8e+08|1.1e+00|2.0e-06| ✓
lu 1 1
6|0.950|0.950|2.3e-07|5.1e+00|6.2e+07| 2.279450e+07| 0:0:00|9.4e+06|1.1e+00|2.5e-07| ✓
lu 1 1
7|0.606|0.606|1.4e-07|3.1e+00|4.4e+07| 1.654727e+07| 0:0:00|4.1e+06|1.1e+00|1.5e-07| ✓
lu 20 8
8|0.765|0.765|9.4e-08|2.1e+00|3.4e+07| 1.277203e+07| 0:0:00|1.2e+06|1.1e+00|1.0e-07| ✓
lu 1 1
9|0.243|0.243|8.6e-08|1.9e+00|3.3e+07| 1.206821e+07| 0:0:00|1.0e+06|1.1e+00|9.1e-08| ✓
lu ^12 20
10|0.948|0.948|3.5e-08|7.7e-01|1.4e+07| 5.931190e+06| 0:0:00|3.1e+05|1.1e+00|3.7e-08| ✓
lu 12 15
11|0.925|0.925|1.4e-08|3.1e-01|6.0e+06| 2.141407e+06| 0:0:00|1.4e+05|9.9e-01|1.4e-08| ✓
lu 1 1
12|0.972|0.972|3.3e-09|7.4e-02|1.5e+06| 4.138066e+05| 0:0:00|5.3e+04|9.5e-01|3.2e-09| ✓
lu 20 20
13|0.106|0.106|3.4e-09|7.6e-02|1.4e+06| 3.956624e+05| 0:0:00|4.9e+04|9.4e-01|3.2e-09| ✓
lu 20 20
14|0.810|0.810|2.3e-09|5.0e-02|1.0e+06| 2.969128e+05| 0:0:00|1.7e+04|9.4e-01|2.1e-09| ✓
lu 1 1
15|0.963|0.963|8.3e-10|2.0e-02|4.1e+05| 1.314463e+05| 0:0:00|7.8e+03|9.1e-01|8.3e-10| ✓
lu 1 1
16|1.000|1.000|4.1e-10|8.8e-03|1.8e+05| 4.934544e+04| 0:0:00|2.9e+03|9.0e-01|3.6e-10| ✓
lu 20 20
17|0.154|0.154|4.0e-10|8.5e-03|1.7e+05| 4.550079e+04| 0:0:00|2.6e+03|9.0e-01|3.4e-10| ✓
lu 1 1
18|1.000|1.000|2.6e-10|5.6e-03|1.3e+05| 3.432338e+04| 0:0:00|1.3e+03|8.5e-01|2.2e-10| ✓

```



```

lu 1 1
19|0.902|0.902|6.0e-11|1.3e-03|2.8e+04| 7.195720e+03| 0:0:00|8.5e+02|8.6e-01|5.0e-11| ✓
lu 1 1
20|1.000|1.000|2.4e-11|5.6e-04|1.2e+04| 3.402942e+03| 0:0:00|1.9e+02|8.5e-01|2.2e-11| ✓
lu 1 1
21|1.000|1.000|6.6e-12|1.4e-04|3.1e+03| 8.155493e+02| 0:0:00|7.8e+01|8.5e-01|5.4e-12| ✓
lu 1 1
22|1.000|1.000|2.9e-12|5.9e-05|1.3e+03| 3.803138e+02| 0:0:00|2.0e+01|8.4e-01|2.2e-12| ✓
lu 1 1
23|1.000|1.000|6.1e-13|1.5e-05|3.3e+02| 9.151441e+01| 0:0:00|8.2e+00|8.4e-01|5.6e-13| ✓
lu 1 1
24|1.000|1.000|3.2e-13|6.1e-06|1.4e+02| 4.222871e+01| 0:0:00|2.1e+00|8.4e-01|2.3e-13| ✓
lu 1 1
25|0.988|0.988|5.3e-14|1.3e-06|2.8e+01| 6.902111e+00| 0:0:00|8.5e-01|8.4e-01|4.8e-14| ✓
lu 2 4
26|1.000|1.000|1.2e-13|4.7e-07|1.0e+01| 1.528137e+00| 0:0:00|1.6e-01|8.6e-01|1.8e-14| ✓
lu 1 1
27|0.978|0.978|1.9e-13|1.3e-08|7.7e-01|-2.140324e+00| 0:0:00|6.8e-02|8.6e-01|5.2e-16| ✓
lu 1 1
28|0.990|0.990|3.2e-12|6.6e-09|1.7e-01|-2.075300e+00| 0:0:00|5.8e-03|8.6e-01|2.6e-16| ✓
lu 20 10
29|0.982|0.982|1.4e-12|4.3e-10|3.2e-03|-2.129398e+00| 0:0:00|1.2e-03|8.6e-01|0.0e+00| ✓
lu 20 20
30|0.965|0.965|1.9e-10|5.2e-10|1.1e-04|-2.129459e+00| 0:0:00|6.9e-05|8.6e-01|0.0e+00| ✓
lu 20 20
31|0.966|0.966|4.0e-11|5.2e-10|5.3e-05|-2.129427e+00| 0:0:00|3.6e-06|8.6e-01|0.0e+00| ✓
lu 3 5
32|0.968|0.968|1.1e-10|5.2e-10|2.6e-05|-2.129433e+00| 0:0:00|4.5e-07|8.6e-01|0.0e+00| ✓
lu 20 20
33|0.991|0.991|2.4e-09|5.2e-10|1.4e-05|-2.129436e+00| 0:0:00|1.7e-07|8.6e-01|0.0e+00| ✓
lu 17 16

```

stop: lack of progress in corrector: mucorr/mu = 1.00, corr_convrg_rate = 0.29

```

34|0.391|0.391|2.4e-09|5.2e-10|1.4e-05|-2.129436e+00| 0:0:00|1.7e-07|8.6e-01|0.0e+00|

```

```

-----
number of iterations    = 34
primal objective value  = -2.13531661e+00
dual   objective value  = -2.12355451e+00
gap := trace(XZ)        = 1.35e-05
relative gap            = 4.32e-06
actual relative gap     = -2.24e-03
rel. primal infeas      = 2.39e-09
rel. dual   infeas      = 5.22e-10
norm(X), norm(y), norm(Z) = 3.2e+12, 4.5e+10, 5.5e+01
norm(A), norm(b), norm(C) = 1.3e+09, 3.1e+09, 5.7e+01
Total CPU time (secs)   = 0.35
CPU time per iteration  = 0.01
termination code        = -2
DIMACS errors: 2.4e-09  0.0e+00  5.2e-10  0.0e+00  -2.2e-03  2.6e-06
-----

```

ans =

2.1236

Iteration 5 Total error is: 0.025713

```

num. of constraints = 21
dim. of socp var = 22, num. of socp blk = 1
dim. of linear var = 116
8 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|2.4e+07|4.4e+13| 1.096333e+12| 0:0:00|4.4e+14|1.0e+00|1.0e+00| ✓
chol 1 1
1|0.942|0.942|6.6e-02|1.6e+06|4.4e+12| 9.523734e+11| 0:0:00|2.5e+13|1.0e+00|6.7e-02| ✓
chol 2 2
2|0.110|0.110|6.2e-02|1.5e+06|4.9e+12| 1.058563e+12| 0:0:00|2.3e+13|9.9e-01|6.1e-02| ✓
chol 2 2
3|0.937|0.937|4.5e-03|1.1e+05|6.7e+11| 2.832754e+11| 0:0:00|4.7e+11|1.0e+00|4.7e-03| ✓
chol 2 2
4|0.982|0.982|9.8e-05|2.3e+03|1.3e+10| 5.445659e+09| 0:0:00|5.6e+09|1.1e+00|1.0e-04| ✓
chol
SMW too ill-conditioned, switch to LU factor, 3.3e+33.
switch to LU factor lu 1 1
5|0.985|0.985|1.8e-06|4.3e+01|2.4e+08| 7.628741e+07| 0:0:00|2.0e+08|1.1e+00|2.0e-06| ✓
lu 1 1
6|0.955|0.955|1.8e-07|4.2e+00|5.0e+07| 1.784948e+07| 0:0:00|9.2e+06|1.1e+00|1.9e-07| ✓
lu 1 2
7|0.687|0.687|1.0e-07|2.4e+00|3.6e+07| 1.316255e+07| 0:0:00|3.2e+06|1.1e+00|1.1e-07| ✓
lu 1 2
8|0.906|0.906|5.1e-08|1.2e+00|2.2e+07| 7.972647e+06| 0:0:00|5.9e+05|1.1e+00|5.5e-08| ✓
lu 12 20
9|0.304|0.304|4.4e-08|1.0e+00|2.0e+07| 7.047300e+06| 0:0:00|4.8e+05|1.1e+00|4.6e-08| ✓
lu 20 5
10|0.952|0.952|1.7e-08|4.0e-01|7.9e+06| 3.118189e+06| 0:0:00|1.8e+05|1.0e+00|1.8e-08| ✓
lu 20 20
11|0.757|0.757|8.5e-09|2.0e-01|4.1e+06| 1.438778e+06| 0:0:00|9.5e+04|9.9e-01|8.4e-09| ✓
lu 20 20
12|0.430|0.430|6.4e-09|1.5e-01|3.2e+06| 1.066830e+06| 0:0:00|6.8e+04|9.8e-01|6.3e-09| ✓
lu 20 20
13|0.760|0.760|3.7e-09|8.8e-02|1.9e+06| 6.375276e+05| 0:0:00|3.4e+04|9.8e-01|3.6e-09| ✓
lu 20 20
14|0.256|0.256|3.1e-09|7.2e-02|1.6e+06| 5.272380e+05| 0:0:00|2.8e+04|1.0e+00|3.1e-09| ✓
lu 20 20
15|0.803|0.803|1.0e-09|2.6e-02|5.6e+05| 1.891106e+05| 0:0:00|1.5e+04|9.9e-01|1.1e-09| ✓
lu 1 1
16|0.921|0.921|7.4e-10|1.8e-02|3.9e+05| 1.067746e+05| 0:0:00|5.5e+03|9.6e-01|7.3e-10| ✓
lu 1 2
17|0.936|0.936|5.1e-10|1.2e-02|2.6e+05| 8.111475e+04| 0:0:00|3.2e+03|9.0e-01|4.5e-10| ✓
lu 11 3

```

```

18|0.905|0.905|1.4e-10|3.4e-03|7.4e+04| 2.073175e+04| 0:0:00|1.8e+03|9.1e-01|1.3e-10| ✓
lu 5 4
19|1.000|1.000|6.6e-11|1.5e-03|3.5e+04| 9.724967e+03| 0:0:00|5.5e+02|8.9e-01|5.8e-11| ✓
lu 2 2
20|1.000|1.000|1.5e-11|3.7e-04|8.4e+03| 2.337194e+03| 0:0:00|2.3e+02|8.8e-01|1.4e-11| ✓
lu 14 18
21|1.000|1.000|7.0e-12|1.6e-04|3.7e+03| 1.020939e+03| 0:0:00|6.0e+01|8.6e-01|5.7e-12| ✓
lu 1 1
22|1.000|1.000|1.4e-12|3.5e-05|8.2e+02| 2.321028e+02| 0:0:00|2.4e+01|8.6e-01|1.3e-12| ✓
lu 1 6
23|1.000|1.000|8.1e-13|1.6e-05|3.9e+02| 1.132680e+02| 0:0:00|5.5e+00|8.5e-01|5.8e-13| ✓
lu 1 1
24|0.990|0.990|2.1e-13|3.5e-06|8.1e+01| 2.361357e+01| 0:0:00|2.4e+00|8.5e-01|1.2e-13| ✓
lu 1 1
25|1.000|1.000|1.3e-13|1.5e-06|3.6e+01| 9.800734e+00| 0:0:00|5.1e-01|8.5e-01|5.4e-14| ✓
lu 1 1
26|1.000|1.000|1.7e-14|1.8e-07|5.1e+00|-9.755366e-01| 0:0:00|2.2e-01|8.5e-01|6.5e-15| ✓
lu ^ 3 4
27|0.889|0.889|3.6e-13|1.1e-07|2.9e+00|-1.670310e+00| 0:0:00|5.6e-02|8.4e-01|3.9e-15| ✓
lu 3 5
28|0.607|0.607|3.0e-12|8.1e-08|2.2e+00|-1.674175e+00| 0:0:00|3.3e-02|8.3e-01|2.8e-15| ✓
lu 2 4
29|0.855|0.855|8.3e-13|5.1e-08|1.4e+00|-1.810403e+00| 0:0:00|1.6e-02|8.4e-01|1.8e-15| ✓
lu 1 1
30|0.941|0.941|4.6e-14|2.2e-09|8.7e-02|-2.224099e+00| 0:0:00|9.1e-03|8.4e-01|7.9e-17| ✓
lu 20 20
31|0.936|0.936|5.0e-12|6.9e-10|3.8e-02|-2.229654e+00| 0:0:00|1.1e-03|8.4e-01|2.5e-17| ✓
lu 1 1
32|0.952|0.952|2.0e-12|5.0e-10|1.9e-03|-2.238978e+00| 0:0:00|2.8e-04|8.4e-01|0.0e+00| ✓
lu 20 5
33|0.989|0.989|1.4e-11|5.3e-10|1.0e-03|-2.239057e+00| 0:0:00|1.6e-05|8.4e-01|0.0e+00| ✓
lu 5 14
34|1.000|1.000|9.4e-12|5.6e-10|1.8e-04|-2.239249e+00| 0:0:00|6.5e-06|8.4e-01|0.0e+00| ✓
lu 20 20
35|1.000|1.000|8.4e-09|5.6e-10|3.3e-05|-2.239224e+00| 0:0:00|1.1e-06|8.5e-01|0.0e+00| ✓
lu 20 20
36|0.963|0.963|5.5e-08|5.6e-10|2.6e-05|-2.239250e+00| 0:0:00|2.5e-07|8.5e-01|0.0e+00|
Stop: infeas has deteriorated too much, 5.5e-08

```

```

-----
number of iterations    = 36
primal objective value = -2.24597921e+00
dual   objective value = -2.23246804e+00
gap := trace(XZ)       = 3.30e-05
relative gap           = 1.02e-05
actual relative gap     = -2.47e-03
rel. primal infeas      = 8.43e-09
rel. dual   infeas      = 5.59e-10
norm(X), norm(y), norm(Z) = 3.2e+12, 4.3e+10, 5.5e+01
norm(A), norm(b), norm(C) = 1.4e+09, 3.5e+09, 5.7e+01
Total CPU time (secs)   = 0.41
CPU time per iteration = 0.01
termination code        = -7
DIMACS errors: 8.4e-09  0.0e+00  5.6e-10  0.0e+00  -2.5e-03  6.0e-06
-----

```

ans =

2.2325

Iteration 6 Total error is: 0.026226

num. of constraints = 21
dim. of socp var = 22, num. of socp blk = 1
dim. of linear var = 116
8 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|2.4e+07|4.5e+13| 1.123722e+12| 0:0:00|4.5e+14|1.0e+00|1.0e+00| ✓
chol 1 1
1|0.942|0.942|6.6e-02|1.6e+06|4.5e+12| 9.761484e+11| 0:0:00|2.6e+13|1.0e+00|6.7e-02| ✓
chol 2 2
2|0.109|0.109|6.2e-02|1.5e+06|5.1e+12| 1.087691e+12| 0:0:00|2.4e+13|9.9e-01|6.1e-02| ✓
chol 2 2
3|0.937|0.937|4.5e-03|1.1e+05|6.9e+11| 2.916792e+11| 0:0:00|4.8e+11|1.0e+00|4.7e-03| ✓
chol 2 2
4|0.982|0.982|9.9e-05|2.3e+03|1.4e+10| 5.635360e+09| 0:0:00|5.8e+09|1.1e+00|1.1e-04| ✓
chol
SMW too ill-conditioned, switch to LU factor, 3.1e+33.
switch to LU factor lu 1 1
5|0.985|0.985|1.8e-06|4.3e+01|2.5e+08| 7.794550e+07| 0:0:00|2.1e+08|1.1e+00|2.0e-06| ✓
lu 1 1
6|0.956|0.956|1.7e-07|4.0e+00|4.8e+07| 1.690333e+07| 0:0:00|9.3e+06|1.1e+00|1.8e-07| ✓
lu 1 1
7|0.694|0.694|9.6e-08|2.3e+00|3.4e+07| 1.260485e+07| 0:0:00|3.2e+06|1.1e+00|1.0e-07| ✓
lu 6 4
8|0.858|0.858|4.3e-08|1.0e+00|1.9e+07| 7.675348e+06| 0:0:00|7.3e+05|1.1e+00|4.6e-08| ✓
lu 20 20
9|0.289|0.289|3.8e-08|8.9e-01|1.7e+07| 6.798534e+06| 0:0:00|5.8e+05|1.0e+00|3.9e-08| ✓
lu 20 20
10|0.943|0.943|1.6e-08|3.8e-01|7.8e+06| 3.076250e+06| 0:0:00|1.7e+05|1.0e+00|1.6e-08| ✓
lu 1 1
11|0.957|0.957|5.8e-09|1.4e-01|2.9e+06| 9.527192e+05| 0:0:00|7.3e+04|9.7e-01|5.6e-09| ✓
lu 1 1
12|0.858|0.858|1.1e-09|2.7e-02|5.7e+05| 1.895832e+05| 0:0:00|2.8e+04|9.7e-01|1.1e-09| ✓
lu 20 1
13|0.841|0.841|7.3e-10|1.7e-02|3.7e+05| 9.490276e+04| 0:0:00|7.9e+03|9.7e-01|7.0e-10| ✓
lu 2 3
14|0.960|0.960|3.2e-10|7.4e-03|1.6e+05| 4.921531e+04| 0:0:00|3.1e+03|9.3e-01|2.9e-10| ✓
lu 11 1
15|0.958|0.958|7.5e-11|1.7e-03|3.7e+04| 1.132948e+04| 0:0:00|1.2e+03|9.3e-01|6.8e-11| ✓
```

```

lu 1 20
16|1.000|1.000|3.9e-11|8.9e-04|2.1e+04| 5.624451e+03| 0:0:00|3.1e+02|8.9e-01|3.4e-11| ✓
lu 5 1
17|0.979|0.979|1.0e-11|2.0e-04|4.5e+03| 1.286315e+03| 0:0:00|1.4e+02|9.0e-01|7.6e-12| ✓
lu 6 1
18|1.000|1.000|3.9e-12|9.4e-05|2.1e+03| 5.651718e+02| 0:0:00|3.0e+01|9.0e-01|3.5e-12| ✓
lu 5 7
19|1.000|1.000|9.4e-13|2.4e-05|5.5e+02| 1.662435e+02| 0:0:00|1.4e+01|9.1e-01|9.4e-13| ✓
lu 1 1
20|1.000|1.000|3.8e-13|9.3e-06|2.1e+02| 5.582277e+01| 0:0:00|3.6e+00|9.2e-01|3.6e-13| ✓
lu 2 3
21|1.000|1.000|1.1e-13|3.4e-06|7.4e+01| 2.266385e+01| 0:0:00|1.3e+00|9.4e-01|1.3e-13| ✓
lu 1 2
22|0.998|0.998|7.4e-14|7.5e-07|1.6e+01| 2.665283e+00| 0:0:00|4.5e-01|9.8e-01|3.1e-14| ✓
lu 2 5
23|1.000|1.000|1.1e-12|2.7e-07|5.4e+00|-2.681957e-01| 0:0:00|8.0e-02|1.0e+00|1.2e-14| ✓
lu 5 20
24|0.615|0.615|2.2e-11|2.2e-07|5.2e+00|-4.658804e+00| 0:0:00|5.6e-02|1.1e+00|9.9e-15| ✓
lu 10 12
25|0.254|0.254|1.7e-11|2.7e-07|9.9e+00|-1.361013e+00| 0:0:00|5.2e-02|1.1e+00|1.2e-14| ✓
lu 9 13
26|0.680|0.680|5.3e-12|1.7e-07|5.2e+00|-1.533218e+00| 0:0:00|6.8e-02|1.1e+00|7.7e-15| ✓
lu 1 1
27|0.713|0.713|1.6e-12|1.4e-07|3.3e+00|-1.245836e+00| 0:0:00|4.8e-02|1.1e+00|6.2e-15| ✓
lu 20 20
28|0.632|0.632|1.9e-11|1.6e-07|4.7e+00|-3.049680e+00| 0:0:00|3.4e-02|1.1e+00|7.0e-15| ✓
lu 1 1
29|0.536|0.536|8.6e-12|1.2e-07|3.3e+00|-2.813513e+00| 0:0:00|3.5e-02|1.1e+00|5.3e-15| ✓
lu 1 1
30|0.540|0.540|4.9e-12|9.2e-08|2.7e+00|-1.708552e+00| 0:0:00|3.0e-02|1.1e+00|4.1e-15| ✓
lu 2 3
31|0.921|0.921|1.9e-12|9.4e-09|2.4e-01|-2.174730e+00| 0:0:00|2.1e-02|1.1e+00|4.3e-16| ✓
lu 18 7
32|0.024|0.024|3.7e-11|1.2e-08|7.8e-01|-2.327831e+00| 0:0:00|2.0e-02|1.1e+00|5.4e-16| ✓
lu 4 9
33|0.576|0.576|1.5e-11|2.9e-08|4.9e-01|-2.136332e+00| 0:0:00|1.2e-02|1.1e+00|1.3e-15| ✓
lu 2 1
34|0.879|0.879|7.5e-13|2.2e-08|3.8e-01|-2.071731e+00| 0:0:00|5.0e-03|1.1e+00|1.0e-15| ✓
lu 20 20
35|0.052|0.052|3.6e-11|5.8e-08|5.8e-01|-3.010372e+00| 0:0:00|4.9e-03|1.1e+00|0.0e+00| ✓
lu 20 2
36|1.000|1.000|1.7e-13|2.9e-08|5.8e-01|-2.123096e+00| 0:0:00|4.6e-03|1.1e+00|1.3e-15| ✓
lu 1 1
37|0.959|0.959|8.8e-13|9.3e-10|2.4e-02|-2.214846e+00| 0:0:00|4.6e-03|1.1e+00|4.3e-17| ✓
lu 13 13
38|0.017|0.017|1.0e-11|1.2e-08|1.9e-02|-2.108753e+00| 0:0:00|4.5e-03|1.1e+00|5.5e-16| ✓
lu 20 20
39|0.041|0.041|2.1e-11|8.2e-08|1.3e+00|-2.027124e+00| 0:0:00|4.3e-03|1.1e+00|3.8e-15| ✓
lu 1 1
40|0.600|0.600|8.3e-12|5.1e-08|8.7e-01|-2.257874e+00| 0:0:00|8.1e-03|1.1e+00|2.3e-15| ✓
lu 13 6
41|0.172|0.172|6.8e-12|8.6e-08|9.6e-01|-1.572463e+00| 0:0:00|7.9e-03|1.1e+00|3.9e-15| ✓
lu 6 7
42|0.905|0.905|7.0e-13|1.1e-08|1.2e-01|-2.169043e+00| 0:0:00|7.6e-03|1.1e+00|4.9e-16| ✓
lu 2 2

```

```

43|0.912|0.912|1.5e-13|3.9e-09|5.5e-02|-2.183793e+00| 0:0:00|1.6e-03|1.1e+00|1.8e-16| ✓
lu 20 20
44|1.000|1.000|2.4e-11|8.3e-09|2.5e-02|-2.298116e+00| 0:0:00|4.5e-04|1.1e+00|0.0e+00| ✓
lu 5 18
45|0.737|0.737|7.0e-11|2.8e-09|1.4e-02|-2.242071e+00| 0:0:00|2.6e-04|1.1e+00|0.0e+00| ✓
lu 20 20
46|0.000|0.000|1.9e-10|5.9e-09|8.6e-02|-2.295246e+00| 0:0:00|2.6e-04|1.1e+00|0.0e+00|
Stop: progress is bad*

```

```

-----
number of iterations      = 46
primal objective value = -2.35316479e+00
dual   objective value = -2.23732733e+00
gap := trace(XZ)         = 8.57e-02
relative gap              = 2.60e-02
actual relative gap       = -2.07e-02
rel. primal infeas        = 1.90e-10
rel. dual   infeas        = 5.86e-09
norm(X), norm(y), norm(Z) = 1.9e+09, 4.4e+10, 5.6e+01
norm(A), norm(b), norm(C) = 1.4e+09, 3.6e+09, 5.7e+01
Total CPU time (secs)     = 0.48
CPU time per iteration    = 0.01
termination code          = -5
DIMACS errors: 1.9e-10  0.0e+00  5.9e-09  0.0e+00  -2.1e-02  1.5e-02
-----

```

ans =

2.2340

Iteration 7 Total error is: 0.026131

```

num. of constraints = 21
dim. of socp var   = 22,   num. of socp blk = 1
dim. of linear var = 116
8 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|2.4e+07|4.5e+13| 1.132798e+12| 0:0:00|4.5e+14|1.0e+00|1.0e+00| ✓
chol 1 1

```

```

1|0.942|0.942|6.6e-02|1.6e+06|4.6e+12| 9.849668e+11| 0:0:00|2.6e+13|1.0e+00|6.7e-02| ✓
chol 2 2

```

```

2|0.111|0.111|6.2e-02|1.5e+06|5.1e+12| 1.099886e+12| 0:0:00|2.4e+13|9.9e-01|6.1e-02| ✓
chol 2 2

```

```

3|0.937|0.937|4.5e-03|1.1e+05|6.9e+11| 2.952514e+11| 0:0:00|4.9e+11|1.0e+00|4.7e-03| ✓
chol 2 2

```

```

4|0.982|0.982|9.9e-05|2.4e+03|1.4e+10| 5.710509e+09| 0:0:00|5.8e+09|1.1e+00|1.1e-04| ✓
chol
    SMW too ill-conditioned, switch to LU factor, 2.8e+33.
    switch to LU factor lu 1 1
5|0.985|0.985|1.8e-06|4.4e+01|2.5e+08| 7.837748e+07| 0:0:00|2.1e+08|1.1e+00|2.0e-06| ✓
lu 1 1
6|0.957|0.957|1.6e-07|3.8e+00|4.6e+07| 1.585316e+07| 0:0:00|9.0e+06|1.1e+00|1.7e-07| ✓
lu 1 1
7|0.704|0.704|9.0e-08|2.2e+00|3.3e+07| 1.194176e+07| 0:0:00|3.0e+06|1.1e+00|9.8e-08| ✓
lu 2 2
8|0.880|0.880|3.8e-08|9.1e-01|1.7e+07| 6.853901e+06| 0:0:00|6.3e+05|1.1e+00|4.1e-08| ✓
lu 20 20
9|0.277|0.277|3.4e-08|8.0e-01|1.6e+07| 6.152029e+06| 0:0:00|5.1e+05|1.0e+00|3.5e-08| ✓
lu 20 20
10|0.941|0.941|1.5e-08|3.6e-01|7.3e+06| 2.867429e+06| 0:0:00|1.6e+05|1.0e+00|1.5e-08| ✓
lu 20 20
11|0.959|0.959|4.9e-09|1.2e-01|2.5e+06| 7.992023e+05| 0:0:00|6.7e+04|9.7e-01|4.7e-09| ✓
lu 1 20
12|0.769|0.769|1.5e-09|3.5e-02|7.4e+05| 2.570408e+05| 0:0:00|2.9e+04|9.8e-01|1.4e-09| ✓
lu 1 1
13|0.799|0.799|9.0e-10|2.2e-02|4.6e+05| 1.334222e+05| 0:0:00|1.0e+04|9.7e-01|8.8e-10| ✓
lu 1 1
14|0.954|0.954|4.3e-10|9.8e-03|2.2e+05| 6.679212e+04| 0:0:00|4.0e+03|9.4e-01|3.9e-10| ✓
lu 2 1
15|0.999|0.999|1.1e-10|2.7e-03|6.2e+04| 1.761187e+04| 0:0:00|1.5e+03|9.3e-01|1.1e-10| ✓
lu 2 3
16|1.000|1.000|5.1e-11|1.2e-03|2.8e+04| 7.876095e+03| 0:0:00|4.7e+02|9.1e-01|4.6e-11| ✓
lu 2 2
17|1.000|1.000|1.2e-11|2.9e-04|6.7e+03| 1.882705e+03| 0:0:00|1.9e+02|8.9e-01|1.1e-11| ✓
lu 1 3
18|1.000|1.000|5.6e-12|1.2e-04|2.9e+03| 8.176255e+02| 0:0:00|4.8e+01|8.7e-01|4.6e-12| ✓
lu 2 4
19|1.000|1.000|1.2e-12|2.8e-05|6.4e+02| 1.844005e+02| 0:0:00|1.8e+01|8.8e-01|1.0e-12| ✓
lu 1 1
20|1.000|1.000|3.2e-13|1.3e-05|2.9e+02| 8.688259e+01| 0:0:00|4.0e+00|8.9e-01|4.7e-13| ✓
lu 1 2
21|0.995|0.995|2.1e-13|2.6e-06|5.7e+01| 1.668386e+01| 0:0:00|1.9e+00|9.1e-01|9.7e-14| ✓
lu 7 6
22|1.000|1.000|6.0e-15|1.1e-06|2.4e+01| 6.112852e+00| 0:0:00|3.7e-01|9.1e-01|4.1e-14| ✓
lu 5 3
23|1.000|1.000|1.9e-13|2.4e-07|6.5e+00|-6.767269e-01| 0:0:00|1.6e-01|9.1e-01|9.2e-15| ✓
lu ^ 2 3
24|0.963|0.963|2.0e-13|4.5e-08|3.5e-01|-2.908906e+00| 0:0:00|4.8e-02|9.2e-01|0.0e+00| ✓
lu 20 20
25|0.444|0.444|7.9e-14|4.7e-08|3.1e-01|-3.035199e+00| 0:0:00|2.7e-02|9.3e-01|0.0e+00| ✓
lu 1 1
26|1.000|1.000|7.4e-13|5.2e-08|2.6e-01|-2.951526e+00| 0:0:00|2.3e-03|9.3e-01|0.0e+00| ✓
lu 2 6
27|0.741|0.741|1.4e-13|5.6e-08|1.5e-01|-3.013882e+00| 0:0:00|1.9e-03|9.4e-01|0.0e+00| ✓
lu ^14 20
28|0.858|0.858|1.4e-11|5.7e-08|7.6e-02|-3.092565e+00| 0:0:00|1.0e-03|9.9e-01|0.0e+00| ✓
lu 20 20
29|0.293|0.293|2.5e-11|5.7e-08|1.1e-01|-2.953307e+00| 0:0:00|9.3e-04|9.7e-01|0.0e+00| ✓
lu 20 9
30|0.000|0.000|3.7e-11|6.2e-08|1.2e-01|-3.127041e+00| 0:0:00|1.0e-03|8.4e-01|1.1e-16| ✓

```

```

lu 20 20
31|0.000|0.000|2.8e-11|6.2e-08|1.3e-01|-3.206718e+00| 0:0:00|1.1e-03|8.0e-01|2.3e-16| ✓
lu 9 8
32|0.038|0.038|5.1e-11|6.2e-08|1.2e-01|-2.978164e+00| 0:0:00|7.2e-04|1.1e+00|0.0e+00| ✓
lu 5 7
33|0.078|0.078|9.9e-11|1.1e-08|1.4e+00|-3.599297e+00| 0:0:00|1.1e-03|5.1e-01|2.3e-15| ✓
lu ^ 3 20
34|0.527|0.527|3.5e-11|3.2e-08|8.4e-01|-3.924116e+00| 0:0:00|3.0e-03|6.7e-01|3.1e-16| ✓
lu 3 2
35|0.919|0.919|2.7e-12|6.0e-08|1.1e-01|-4.215434e+00| 0:0:00|4.0e-03|6.8e-01|0.0e+00| ✓
lu 20 2
36|0.022|0.022|3.5e-12|6.0e-08|1.3e-01|-4.246913e+00| 0:0:00|3.7e-03|7.1e-01|0.0e+00| ✓
lu 20 20
37|0.344|0.344|1.1e-11|6.0e-08|1.4e-01|-4.371531e+00| 0:0:00|3.0e-03|6.5e-01|0.0e+00| ✓
lu 2 4
38|0.045|0.045|7.3e-12|6.0e-08|1.3e-01|-4.088231e+00| 0:0:00|2.2e-03|8.1e-01|0.0e+00| ✓
lu ^ 9 10
39|0.371|0.371|5.2e-12|6.0e-08|9.7e-02|-4.346404e+00| 0:0:00|1.7e-03|8.0e-01|0.0e+00| ✓
lu 20 20
40|0.031|0.031|8.6e-12|6.0e-08|9.2e-02|-4.237032e+00| 0:0:00|1.6e-03|8.0e-01|0.0e+00| ✓
lu ^ 8 20
41|0.000|0.000|1.0e-11|6.0e-08|8.8e-02|-4.180557e+00| 0:0:01|1.6e-03|8.0e-01|0.0e+00| ✓
lu ^ 2 3
42|0.535|0.535|4.9e-12|6.1e-08|7.5e-02|-4.293647e+00| 0:0:01|1.1e-03|7.9e-01|0.0e+00| ✓
lu 20 20
43|0.009|0.009|9.8e-12|6.1e-08|7.4e-02|-4.208209e+00| 0:0:01|1.1e-03|7.9e-01|0.0e+00| ✓
lu 20 20
44|0.000|0.000|1.3e-11|6.1e-08|7.2e-02|-4.208121e+00| 0:0:01|1.0e-03|7.9e-01|0.0e+00| ✓
lu 20 16
45|0.313|0.313|1.5e-11|6.1e-08|8.1e-02|-4.265901e+00| 0:0:01|8.7e-04|7.8e-01|0.0e+00| ✓
lu 20 20
46|0.068|0.068|8.5e-12|6.1e-08|7.8e-02|-4.449022e+00| 0:0:01|8.4e-04|7.8e-01|0.0e+00| ✓
lu 20 3
47|0.421|0.421|5.3e-13|6.1e-08|1.0e-01|-4.090241e+00| 0:0:01|6.5e-04|8.0e-01|0.0e+00| ✓
lu ^13 3
48|0.598|0.598|1.1e-12|6.2e-08|8.7e-02|-4.613193e+00| 0:0:01|6.2e-04|8.0e-01|0.0e+00| ✓
lu 3 20
49|0.012|0.012|8.0e-12|6.2e-08|7.9e-02|-4.384730e+00| 0:0:01|6.2e-04|8.0e-01|0.0e+00| ✓
lu ^ 3 13
50|0.165|0.165|5.1e-12|6.2e-08|6.2e-02|-4.586917e+00| 0:0:01|5.8e-04|8.1e-01|0.0e+00|
  Stop: maximum number of iterations reached
-----
number of iterations      = 50
primal objective value    = -5.38863021e+00
dual   objective value    = -3.78520315e+00
gap := trace(XZ)          = 6.25e-02
relative gap              = 1.12e-02
actual relative gap       = -1.58e-01
rel. primal infeas        = 5.14e-12
rel. dual   infeas        = 6.16e-08
norm(X), norm(y), norm(Z) = 3.2e+12, 1.7e+10, 5.1e+01
norm(A), norm(b), norm(C) = 1.4e+09, 3.6e+09, 5.7e+01
Total CPU time (secs)     = 0.63
CPU time per iteration    = 0.01
termination code          = -6

```



```
DIMACS errors: 5.1e-12  0.0e+00  6.2e-08  0.0e+00  -1.6e-01  6.1e-03
```

```
-----
```

```
ans =
```

```
3.7796
```

```
Iteration    8    Total error is: 0.034524
```

```
The total representation error of the testing signals is: 0.029856
```

```
>>
```