```
cvx_solver sdpt3

% 1
cvx_begin
  variables x(4) y z(5) p(2)
  minimize y + abs(x(3)-x(4)+7)
  subject to
    [z(2), x(2)-5; x(2)-5, 1] == semidefinite(2);
    p(1) >= abs(x(3) - 1);
    p(1) >= 0;
    [z(3), p(2); p(2), p(1)] == semidefinite(2);
    [p(2), p(1); p(1), 1] == semidefinite(2);
    [z(4), x(4)+1; x(4)+1, 1] == semidefinite(2);
    [z(5), z(4); z(4), 1] == semidefinite(2);
    y >= 0;
    [[y, x(1), z(2), z(3), z(5), sqrt(2)];[[x(1); z(2); z(3); z(5); sqrt(2)],
eye(5)*y]] == semidefinite(6);
    x(1)^2 + x(2)^2 + x(4)^2 <= 2;
cvx_end
```

```
Calling SDPT3 4.0: 53 variables, 16 equality constraints
   For improved efficiency, SDPT3 is solving the dual problem.
------------------------------------------------------------

 num. of constraints = 16
 dim. of sdp    var  = 22,   num. of sdp  blk  =  9
 dim. of socp   var  =  4,   num. of socp blk  =  2
 dim. of linear var  =  4
*****************************************************************
   SDPT3: Infeasible path-following algorithms
*****************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-------------------------------------------------------------------
 0|0.000|0.000|3.6e+01|4.2e+00|2.8e+03| 9.000000e+01  0.000000e+00| 0:0:00| chol  1  1
 1|0.731|0.743|9.7e+00|1.1e+00|9.1e+02| 5.595032e+01 -2.080973e+01| 0:0:00| chol  1  1
 2|0.785|0.778|2.1e+00|2.5e-01|2.3e+02| 1.917985e+01 -2.627226e+01| 0:0:00| chol  1  1
 3|0.589|0.844|8.6e-01|3.9e-02|1.4e+02| 2.420214e+01 -3.676013e+01| 0:0:00| chol  1  1
 4|0.916|1.000|7.2e-02|4.3e-05|2.1e+01|-1.139205e+01 -2.872880e+01| 0:0:00| chol  1  1
 5|1.000|1.000|9.5e-08|8.5e-03|8.5e+00|-1.479733e+01 -2.255509e+01| 0:0:00| chol  1  1
 6|0.949|0.943|1.9e-08|4.8e-04|9.5e-01|-1.931226e+01 -2.021769e+01| 0:0:00| chol  1  1
 7|1.000|1.000|5.2e-09|4.6e-08|1.6e-01|-1.973566e+01 -1.989173e+01| 0:0:00| chol  1  1
 8|0.978|0.980|3.1e-09|6.1e-09|3.3e-03|-1.982081e+01 -1.982415e+01| 0:0:00| chol  1  1
 9|0.985|0.987|8.9e-10|7.1e-10|4.7e-05|-1.982267e+01 -1.982272e+01| 0:0:00| chol  1  1
10|0.962|0.975|3.4e-11|2.0e-10|1.6e-06|-1.982270e+01 -1.982270e+01| 0:0:00| chol  2  2
11|1.000|1.000|1.3e-12|6.8e-12|1.7e-07|-1.982270e+01 -1.982270e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.49e-08
-------------------------------------------------------------------
 number of iterations   = 11
 primal objective value = -1.98227009e+01
 dual   objective value = -1.98227011e+01
 gap := trace(XZ)       = 1.74e-07
 relative gap           = 4.27e-09
 actual relative gap    = 4.26e-09
 rel. primal infeas (scaled problem)   = 1.33e-12
 rel. dual     "        "       "      = 6.79e-12
```

```
 rel. primal infeas (unscaled problem) = 0.00e+00
 rel. dual     "        "       "      = 0.00e+00
 norm(X), norm(y), norm(Z) = 1.6e+01, 2.0e+01, 4.4e+01
 norm(A), norm(b), norm(C) = 8.1e+00, 2.4e+00, 1.2e+01
 Total CPU time (secs)  = 0.09
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS: 1.6e-12  0.0e+00  9.4e-12  0.0e+00  4.3e-09  4.3e-09
------------------------------------------------------------------

------------------------------------------------------------
Status: Solved
Optimal value (cvx_optval): +19.8227
```

```
% disp(x);
% disp(cvx_optval);

% 2
A = [1, 5/2, -1/2; 5/2, 8, 0; -1/2, 0, 9];
cvx_begin
  variables x(3) y
  minimize quad_form(x, A) + ...
      8*(abs(x(1)-1) + abs(x(2)+3) + abs(x(3)-5))
  subject to
    [5, y; y, x(2)+1] == semidefinite(2);
    [y, x(3); x(3), 1] == semidefinite(2);
cvx_end
```

```
Calling SDPT3 4.0: 17 variables, 8 equality constraints
   For improved efficiency, SDPT3 is solving the dual problem.
------------------------------------------------------------

 num. of constraints =  8
 dim. of sdp    var  =  4,   num. of sdp  blk  =  2
 dim. of socp   var  = 11,   num. of socp blk  =  4
*****************************************************************
   SDPT3: Infeasible path-following algorithms
*****************************************************************
 version  predcorr  gam  expon  scale_data
   HKM      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-------------------------------------------------------------------
 0|0.000|0.000|1.9e+00|2.1e+00|1.3e+03| 1.040000e+02  0.000000e+00| 0:0:00| chol  1  1
 1|0.670|0.983|6.3e-01|5.9e-02|3.4e+02| 5.267571e+01 -2.004260e+02| 0:0:00| chol  1  1
 2|0.857|0.981|9.0e-02|3.4e-03|3.7e+01|-4.648898e+01 -7.648869e+01| 0:0:00| chol  1  1
 3|0.967|0.663|2.9e-03|9.3e-03|1.7e+01|-5.382118e+01 -6.862934e+01| 0:0:00| chol  1  1
 4|1.000|0.852|4.1e-08|2.0e-03|5.3e+00|-6.021653e+01 -6.522092e+01| 0:0:00| chol  1  1
 5|0.830|1.000|8.3e-09|2.3e-06|1.2e+00|-6.269617e+01 -6.386102e+01| 0:0:00| chol  1  1
 6|1.000|0.852|3.3e-09|5.4e-07|3.0e-01|-6.325815e+01 -6.356090e+01| 0:0:00| chol  1  1
 7|0.942|0.981|6.3e-10|3.3e-08|1.5e-02|-6.345607e+01 -6.347155e+01| 0:0:00| chol  1  1
 8|0.884|1.000|6.2e-10|2.4e-09|2.0e-03|-6.346699e+01 -6.346899e+01| 0:0:00| chol  1  1
 9|0.983|0.984|1.0e-10|1.6e-10|6.8e-05|-6.346870e+01 -6.346876e+01| 0:0:00| chol  1  1
10|0.989|0.989|1.1e-12|2.2e-11|7.5e-07|-6.346875e+01 -6.346875e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.49e-08
-------------------------------------------------------------------
 number of iterations   = 10
 primal objective value = -6.34687494e+01
```

```
 dual   objective value = -6.34687501e+01
 gap := trace(XZ)       = 7.51e-07
 relative gap           = 5.87e-09
 actual relative gap    = 5.85e-09
 rel. primal infeas (scaled problem)   = 1.12e-12
 rel. dual     "        "       "      = 2.20e-11
 rel. primal infeas (unscaled problem) = 0.00e+00
 rel. dual     "        "       "      = 0.00e+00
 norm(X), norm(y), norm(Z) = 2.3e+01, 7.2e+00, 8.9e+00
 norm(A), norm(b), norm(C) = 5.1e+00, 1.9e+01, 1.2e+01
 Total CPU time (secs)  = 0.06
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS: 1.7e-12  0.0e+00  4.0e-11  0.0e+00  5.8e-09  5.9e-09
------------------------------------------------------------------

------------------------------------------------------------
Status: Solved
Optimal value (cvx_optval): +57.4688
```

```
% 3
cvx_begin
  variables x(3)
  minimize 2*x(1) + 3*x(2) - x(3) + ...
      norm([1/sqrt(3)*x(1), x(2)-5, sqrt(6)*(x(3)-1/3*x(1)), 1], 2)
  subject to
    x(1)+x(2)<=2;
    x(3)+x(2)<=2;
    x(1)+x(3)<=2;
    x(1)>=0;
    x(2)>=0;
cvx_end
```

```
Calling SDPT3 4.0: 10 variables, 4 equality constraints
   For improved efficiency, SDPT3 is solving the dual problem.
------------------------------------------------------------

 num. of constraints =  4
 dim. of socp   var  =  5,   num. of socp blk  =  1
 dim. of linear var  =  5
*****************************************************************
   SDPT3: Infeasible path-following algorithms
*****************************************************************
 version  predcorr  gam  expon  scale_data
    NT      1      0.000   1        0
it pstep dstep pinfeas dinfeas  gap      prim-obj      dual-obj    cputime
-----------------------------------------------------------------------
 0|0.000|0.000|6.7e+00|2.9e+00|5.1e+02| 1.000000e+01  0.000000e+00| 0:0:00| chol  1  1
 1|0.388|0.809|4.1e+00|5.8e-01|2.1e+02| 1.600483e+01 -1.728036e+00| 0:0:00| chol  1  1
 2|1.000|1.000|1.4e-06|3.1e-03|2.9e+01| 2.661892e+01 -2.439470e+00| 0:0:00| chol  1  1
 3|0.962|0.807|1.0e-07|8.5e-04|5.2e+00| 1.386627e+01  8.729644e+00| 0:0:00| chol  1  1
 4|0.902|1.000|1.1e-08|3.1e-05|1.7e+00| 1.104242e+01  9.296406e+00| 0:0:00| chol  1  1
 5|1.000|0.917|8.9e-10|5.4e-06|1.9e-01| 1.044389e+01  1.025775e+01| 0:0:00| chol  1  1
 6|0.949|0.981|9.9e-11|4.0e-07|6.9e-03| 1.034965e+01  1.034277e+01| 0:0:00| chol  1  1
 7|0.960|0.985|6.8e-10|3.6e-08|2.1e-04| 1.034537e+01  1.034516e+01| 0:0:00| chol  1  1
 8|0.904|1.000|2.5e-09|3.0e-11|1.4e-05| 1.034526e+01  1.034525e+01| 0:0:00| chol  1  1
 9|0.945|0.987|3.2e-10|4.5e-11|7.0e-07| 1.034525e+01  1.034525e+01| 0:0:00| chol  2  2
```

```
10|1.000|1.000|8.5e-14|6.4e-11|3.9e-08| 1.034525e+01  1.034525e+01| 0:0:00|
  stop: max(relative gap, infeasibilities) < 1.49e-08
------------------------------------------------------------------
 number of iterations   = 10
 primal objective value =  1.03452533e+01
 dual   objective value =  1.03452533e+01
 gap := trace(XZ)       = 3.85e-08
 relative gap           = 1.78e-09
 actual relative gap    = 1.73e-09
 rel. primal infeas (scaled problem)   = 8.53e-14
 rel. dual     "        "       "      = 6.45e-11
 rel. primal infeas (unscaled problem) = 0.00e+00
 rel. dual     "        "       "      = 0.00e+00
 norm(X), norm(y), norm(Z) = 3.0e+00, 7.8e+00, 8.3e+00
 norm(A), norm(b), norm(C) = 5.4e+00, 5.3e+00, 7.9e+00
 Total CPU time (secs)  = 0.05
 CPU time per iteration = 0.01
 termination code       =  0
 DIMACS: 1.1e-13  0.0e+00  8.5e-11  0.0e+00  1.7e-09  1.8e-09
------------------------------------------------------------------

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Status: Solved
Optimal value (cvx_optval): +4.65475
```