```
% Problem 8
% 8.a
A = [1 8 -1 8 1;
0 1 8 -1 8;
0 0 1 8 -1;
4 1 4 1 4;
7 8 2 6 2]

A =

     1     8    -1     8     1
     0     1     8    -1     8
     0     0     1     8    -1
     4     1     4     1     4
     7     8     2     6     2

eig(A)

ans =

  15.8045 + 0.0000i
   1.2613 + 2.7496i
   1.2613 - 2.7496i
  -4.4063 + 0.0000i
  -7.9208 + 0.0000i

% 8.b
e = poly(A)

e =

   1.0e+03 *

    0.0010   -0.0060   -0.1420   -0.1800   -0.0720   -5.0480

roots(e)

ans =

  15.8045 + 0.0000i
  -7.9208 + 0.0000i
  -4.4063 + 0.0000i
   1.2613 + 2.7496i
   1.2613 - 2.7496i

% 8.c
% Almost the same, but the order of values in the answer vector diffs. Except this,
the values are same.

% Problem 9
% 9.a
A = [0 0  0 0 1 1 0 0 0;
0 0 1 0 1 1 0 0 0;
0 1 0 0 0 1 1 0 0;
0 0 0 0 0 0 0 1 0;
1 1 0 0 0 1 0 0 0;
1 1 1 0 1 0 1 0 0;
0 0 1 0 0 1 0 1 0;
0 0 0 1 0 0 1 0 1;
0 0 0 0 0 0 0 1 0]

A =
```

```
     0     0     0     0     1     1     0     0     0
     0     0     1     0     1     1     0     0     0
     0     1     0     0     0     1     1     0     0
     0     0     0     0     0     0     0     1     0
     1     1     0     0     0     1     0     0     0
     1     1     1     0     1     0     1     0     0
     0     0     1     0     0     1     0     1     0
     0     0     0     1     0     0     1     0     1
     0     0     0     0     0     0     0     1     0
% 9.b
[V,D] = eig(A)

% eigenvectors
V =

    0.2247    0.2157    0.4102   -0.4106    0.0000   -0.4536    0.4876    0.1974
-0.2892
    0.3443    0.4684    0.1596    0.1285   -0.0000    0.6468   -0.0960    0.1525
-0.4115
   -0.2470   -0.3991    0.3662   -0.4597   -0.0000    0.1107   -0.5070   -0.0775
-0.3988
    0.2346   -0.1835   -0.2346   -0.2948   -0.7071    0.2291    0.2664   -0.3800
-0.0384
   -0.0986   -0.5930    0.0639    0.4618   -0.0000    0.1340    0.4362    0.2533
-0.3858
   -0.3654    0.2524   -0.6631   -0.1117    0.0000   -0.1797   -0.0126    0.0877
-0.5572
    0.5311   -0.0906   -0.0313    0.3752    0.0000   -0.4560   -0.3318   -0.3742
-0.3316
   -0.4844    0.2897    0.3426    0.2514    0.0000    0.0231    0.2314   -0.6565
-0.1253
    0.2346   -0.1835   -0.2346   -0.2948    0.7071    0.2291    0.2664   -0.3800
-0.0384

% eigenvalues
D =

   -2.0650         0         0         0         0         0         0
0         0
         0   -1.5792         0         0         0         0         0
0         0
         0         0   -1.4606         0         0         0         0
0         0
         0         0         0   -0.8528         0         0         0
0         0
         0         0         0         0    0.0000         0         0
0         0
         0         0         0         0         0    0.1006         0
0         0
         0         0         0         0         0         0    0.8687
0         0
         0         0         0         0         0         0         0
1.7276         0
         0         0         0         0         0         0         0         0
3.2607

% 9.c

% 9.c.(i)
% 3.2607 has the largest magnitude.
```

```
% 9.c.(ii)
% No.

% 9.c.(iii)
% -0.7071 and 0.7071 have the largest magnitude.
% Node v6 has the most connections.

% 9.c.(iv)
% No

% 9.c.(v)
% Yes, except on the 5th eigenvector. Their absolute values are also the same on the
5th eigenvector.

% Problem 10
A = [.80 .02 .00 .02 .02;
.05 .70 .00 .04 .00;
.05 .10 .90 .04 .02;
.05 .10 .07 .88 .02;
.05 .08 .03 .02 .94]

A =

    0.8000    0.0200         0    0.0200    0.0200
    0.0500    0.7000         0    0.0400         0
    0.0500    0.1000    0.9000    0.0400    0.0200
    0.0500    0.1000    0.0700    0.8800    0.0200
    0.0500    0.0800    0.0300    0.0200    0.9400

% 10.a
[V1,D1] = eig(A)

% eigenvectors
V1 =

    0.0650   -0.1288    0.0569   -0.7543    0.2970
   -0.8767   -0.0927   -0.0673   -0.2672    0.2416
    0.3158   -0.5030   -0.3769    0.4200   -0.7950
    0.2957   -0.5344   -0.4289    0.3341    0.4352
    0.2002   -0.6605    0.8162    0.2674   -0.1787

% eigenvalues
D1 =

    0.6828         0         0         0         0
         0    1.0000         0         0         0
         0         0    0.9125         0         0
         0         0         0    0.7911         0
         0         0         0         0    0.8335

% 10.b
[v2,D2] = eig(A^2)

% eigenvectors
v2 =

   -0.1288   -0.0650    0.0569   -0.7543    0.2970
   -0.0927    0.8767   -0.0673   -0.2672    0.2416
   -0.5030   -0.3158   -0.3769    0.4200   -0.7950
   -0.5344   -0.2957   -0.4289    0.3341    0.4352
   -0.6605   -0.2002    0.8162    0.2674   -0.1787
```

```
% eigenvalues
D2 =

    1.0000         0         0         0         0
         0    0.4662         0         0         0
         0         0    0.8327         0         0
         0         0         0    0.6259         0
         0         0         0         0    0.6948

% 10.c
[v3,D3] = eig(A^3)

% eigenvectors
v3 =

   -0.1288   -0.0650    0.0569   -0.7543    0.2970
   -0.0927    0.8767   -0.0673   -0.2672    0.2416
   -0.5030   -0.3158   -0.3769    0.4200   -0.7950
   -0.5344   -0.2957   -0.4289    0.3341    0.4352
   -0.6605   -0.2002    0.8162    0.2674   -0.1787

% eigenvalues
D3 =

    1.0000         0         0         0         0
         0    0.3183         0         0         0
         0         0    0.7599         0         0
         0         0         0    0.4952         0
         0         0         0         0    0.5791


% 10.d
% Actually, the eigenvalues for A^2 are sqaure values of eigenvalues for A, the
eigenvalues for A^3 are cube values of eigenvalues for A. And the eigenvectors
corrspanding to each eigenvalue are always same for A, A^2 and A^3.
```