

Bogdan Chwaliński  
grupa Poniedziałek

Zadanie przygotowałem w programie Matlab oraz grafy w programie Mathematica.

Kod programu Matlab:

```
>> Mikolaj = [0,0,0,0,0,0,0,0,0,0,0,0;  
0,0,0,0,0,1,1,0,1,0,0,0;  
0,0,0,0,1,0,0,1,0,0,0,0;  
0,0,0,1,0,0,0,1,0,0,0,0;  
0,1,1,1,1,1,1,1,1,1,0,0;  
0,1,1,0,0,0,0,0,1,1,0,0;  
0,0,1,0,1,0,1,0,1,0,0,0;  
0,0,1,0,0,0,0,0,1,0,0,0;  
0,0,0,1,0,1,0,1,0,0,0,0;  
0,0,0,0,1,1,1,0,0,0,0,0;  
0,0,0,0,0,0,0,0,0,0,0,0;  
0,0,0,0,0,0,0,0,0,0,0,0];
```

Mikolaj =

0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	1	1	0	1	0	0	0
0	0	0	0	1	0	0	1	0	0	0	0
0	0	0	1	0	0	0	1	0	0	0	0
0	1	1	1	1	1	1	1	1	1	0	0
0	1	1	0	0	0	0	0	1	1	0	0
0	0	1	0	1	0	1	0	1	0	0	0
0	0	1	0	0	0	0	0	1	0	0	0
0	0	0	1	0	1	0	1	0	0	0	0
0	0	0	0	1	1	1	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0

```
>> Choinka=[  
0,0,0,0,0,1,1,0,0,0,0,0;  
0,0,0,0,1,1,1,1,0,0,0,0;  
0,0,0,1,1,1,1,1,1,0,0,0;  
0,0,1,1,1,1,1,1,1,1,0,0;  
0,1,1,1,1,1,1,1,1,1,1,0;  
0,0,0,0,0,1,1,0,0,0,0,0;  
0,0,0,0,1,1,1,1,0,0,0,0;  
0,0,0,1,1,1,1,1,1,0,0,0;  
0,0,1,1,1,1,1,1,1,1,0,0;  
0,1,1,1,1,1,1,1,1,1,1,0;  
0,0,0,0,0,1,1,0,0,0,0,0;  
0,0,0,0,0,1,1,0,0,0,0,0];
```

Choinka =

0	0	0	0	0	1	1	0	0	0	0	0
0	0	0	0	1	1	1	1	0	0	0	0
0	0	0	1	1	1	1	1	1	0	0	0
0	0	1	1	1	1	1	1	1	1	0	0
0	1	1	1	1	1	1	1	1	1	1	0
0	0	0	0	0	1	1	0	0	0	0	0
0	0	0	0	1	1	1	1	0	0	0	0
0	0	0	1	1	1	1	1	1	0	0	0
0	0	1	1	1	1	1	1	1	1	0	0
0	1	1	1	1	1	1	1	1	1	1	0
0	0	0	0	0	1	1	0	0	0	0	0
0	0	0	0	0	1	1	0	0	0	0	0

```
>> Prezent = [0,0,0,0,1,1,0,1,1,0,0,0;
0,0,0,0,1,1,0,1,1,0,0,0;
0,0,0,0,0,1,1,1,0,0,0,0;
0,0,1,1,1,1,1,1,1,0,0,0;
0,0,1,0,0,1,1,0,0,1,0,0;
0,0,1,0,0,1,1,0,0,1,0,0;
0,0,1,0,0,1,1,0,0,1,0,0;
0,0,1,1,1,1,1,1,1,0,0,0;
0,0,1,1,1,1,1,1,1,0,0,0;
0,0,1,0,0,1,1,0,0,1,0,0;
0,0,1,0,0,1,1,0,0,1,0,0;
0,0,1,1,1,1,1,1,1,0,0,0;
0,0,0,0,0,0,0,0,0,0,0,0;]
```

Prezent =

0	0	0	0	1	1	0	1	1	0	0	0
0	0	0	0	1	1	0	1	1	0	0	0
0	0	0	0	0	1	1	1	0	0	0	0
0	0	1	1	1	1	1	1	1	1	0	0
0	0	1	0	0	1	1	0	0	1	0	0
0	0	1	0	0	1	1	0	0	1	0	0
0	0	1	1	1	1	1	1	1	1	0	0
0	0	1	1	1	1	1	1	1	1	0	0
0	0	1	0	0	1	1	0	0	1	0	0
0	0	1	0	0	1	1	0	0	1	0	0
0	0	1	1	1	1	1	1	1	1	0	0
0	0	0	0	0	0	0	0	0	0	0	0

```
>> [CHwek,CH]=eigs(Choinka);
>> [Chwek,Ch]=eigs(Choinka);
>> [Mwek,M]=eigs(Mikolaj);
>> [Pwek,P]=eigs(Prezent);
```

Wiodące wektory:

Wiodący wektor własny dla Choinki:

-0.0313  
-0.1566  
-0.2975  
-0.4228  
-0.4541  
-0.0313  
-0.1566  
-0.2975  
-0.4228  
-0.4541  
-0.0313  
-0.0313

Wiodący wektor własny dla Prezentu:

-0.1916  
-0.1916  
-0.1999  
-0.4295  
-0.1929  
-0.1929  
-0.4295  
-0.4295  
-0.1929  
-0.1929  
-0.4295  
-0.0000

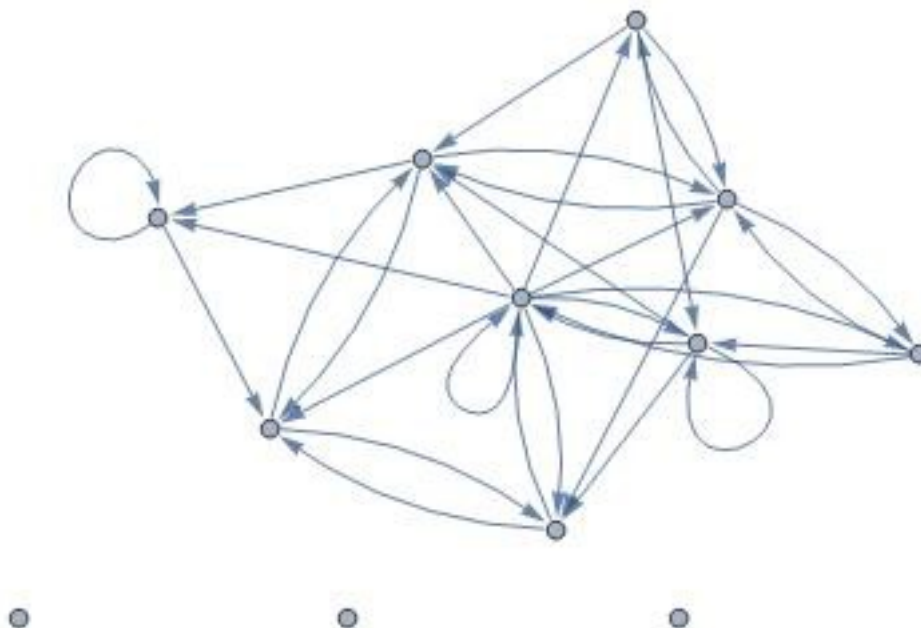
Wiodący wektor własny dla Mikołaja:

0.0000  
-0.2243  
-0.2243  
-0.0378  
-0.6963  
-0.2694  
-0.4086  
-0.0958  
-0.1141  
-0.3891  
0.0000  
0.0000

Grafy w programie Mathematica (kod + jpeg):

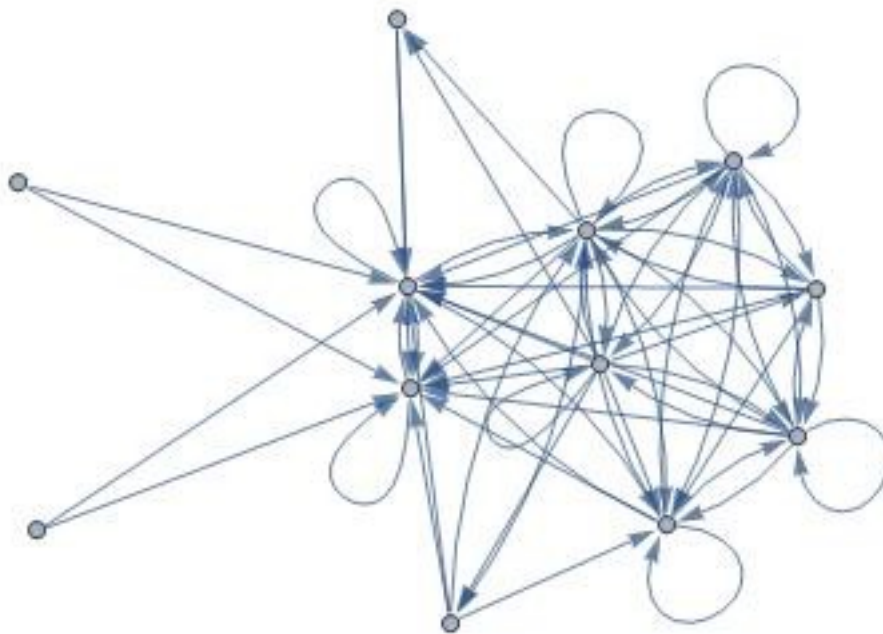
Mikołaj

```
AdjacencyGraph[{  
  {0,0,0,0,0,0,0,0,0,0,0,0,0},  
  {0,0,0,0,0,1,1,0,1,0,0,0},  
  {0,0,0,0,1,0,0,1,0,0,0,0},  
  {0,0,0,1,0,0,0,1,0,0,0,0},  
  {0,1,1,1,1,1,1,1,1,1,0,0},  
  {0,1,1,0,0,0,0,0,1,1,0,0},  
  {0,0,1,0,1,0,1,0,1,0,0,0},  
  {0,0,1,0,0,0,0,0,1,0,0,0},  
  {0,0,0,1,0,1,0,1,0,0,0,0},  
  {0,0,0,0,1,1,1,0,0,0,0,0},  
  {0,0,0,0,0,0,0,0,0,0,0,0},  
  {0,0,0,0,0,0,0,0,0,0,0,0}}]
```



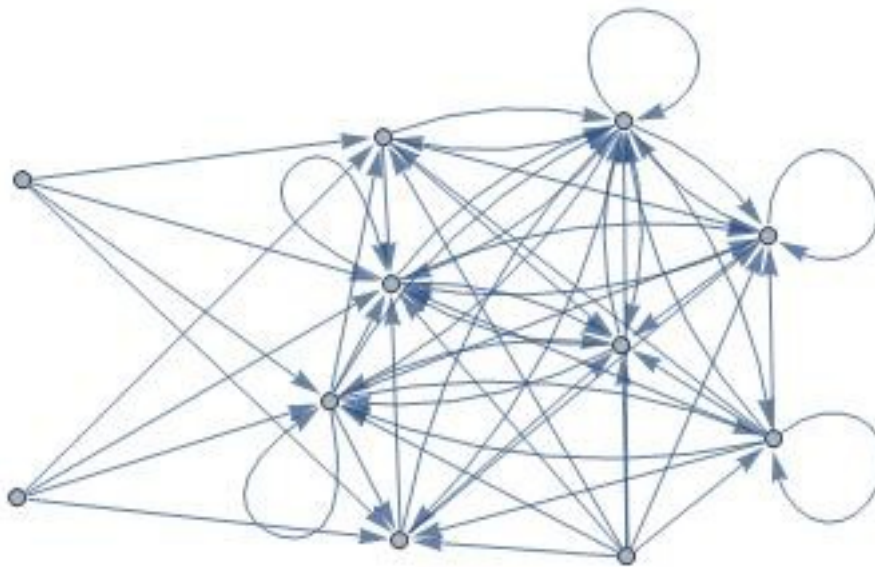
Choinka

```
AdjacencyGraph[ {  
  {0,0,0,0,0,1,1,0,0,0,0,0},  
  {0,0,0,0,1,1,1,1,0,0,0,0},  
  {0,0,0,1,1,1,1,1,1,0,0,0},  
  {0,0,1,1,1,1,1,1,1,1,0,0},  
  {0,1,1,1,1,1,1,1,1,1,1,0},  
  {0,0,0,0,0,1,1,0,0,0,0,0},  
  {0,0,0,0,1,1,1,1,0,0,0,0},  
  {0,0,0,1,1,1,1,1,1,0,0,0},  
  {0,0,1,1,1,1,1,1,1,1,0,0},  
  {0,1,1,1,1,1,1,1,1,1,1,0},  
  {0,0,0,0,0,1,1,0,0,0,0,0},  
  {0,0,0,0,1,1,1,1,0,0,0,0},  
  {0,0,1,1,1,1,1,1,1,1,0,0},  
  {0,1,1,1,1,1,1,1,1,1,1,0},  
  {0,0,0,0,0,1,1,0,0,0,0,0},  
  {0,0,0,0,0,1,1,0,0,0,0,0}}]
```



Prezent

```
AdjacencyGraph[ {  
  {0,0,0,0,1,1,0,1,1,0,0,0},  
  {0,0,0,0,1,1,0,1,1,0,0,0},  
  {0,0,0,0,0,1,1,1,0,0,0,0},  
  {0,0,1,1,1,1,1,1,1,1,0,0},  
  {0,0,1,0,0,1,1,0,0,1,0,0},  
  {0,0,1,0,0,1,1,0,0,1,0,0},  
  {0,0,1,1,1,1,1,1,1,1,0,0},  
  {0,0,1,1,1,1,1,1,1,1,0,0},  
  {0,0,1,0,0,1,1,0,0,1,0,0},  
  {0,0,1,0,0,1,1,0,0,1,0,0},  
  {0,0,1,1,1,1,1,1,1,1,0,0},  
  {0,0,0,0,0,0,0,0,0,0,0,0}}]
```



Widmo macierzy połączeń na płaszczyźnie zespolonej:

Kod programu matlab do wygenerowania rysunku:

```
>> figure(1);  
>> plot(real(Ch),imag(Ch),'b^',real(M),imag(M),'ko',real(P),imag(P),'rs');  
>> legend('Choinka','Mikołaj','Prezent',1)  
>> xlabel('Re');  
>> ylabel('Imag');
```

