

# OEIS A306892

RICHARD J. MATHAR

ABSTRACT. OEIS A306827 counts 2-regular digraphs with  $n$  nodes, allowing multi-edges. Here in A306892 we count 2-regular digraphs allowing multi-edges and loops.

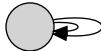
The sequence of connected graphs illustrated further down is 1, 2, 5, 14, ... [1, A306892]. The Multiset Transformation gives the triangle of graphs of this type with  $k$  components:

1	1					
2	2	1				
3	5	2	1			
4	14	8	2	1		
5	50	24	8	2	1	
6	265	93	28	8	2	1

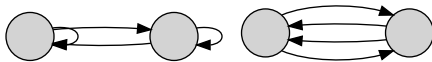
The row sums 1, 3, 8, 25, 85, 397, ... are the number of graphs counted without taking connectivity into account.

These graphs can also be obtained by starting from the cubic QED vacuum polarization diagrams of A170946 [2], and contracting each edge that represents an (undirected) photon line and its two vertices into a single node.

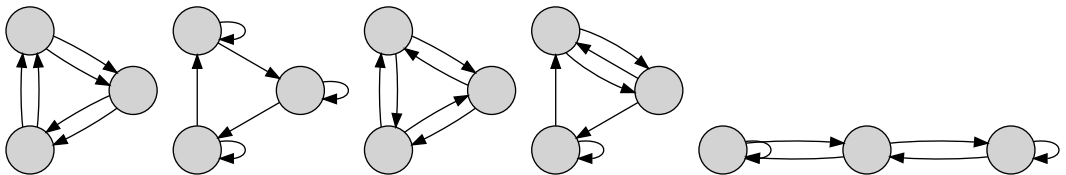
1 GRAPH ON 1 NODE



3 GRAPHS (2 CONNECTED) ON 2 NODES



8 GRAPHS (5 CONNECTED) ON 3 NODES

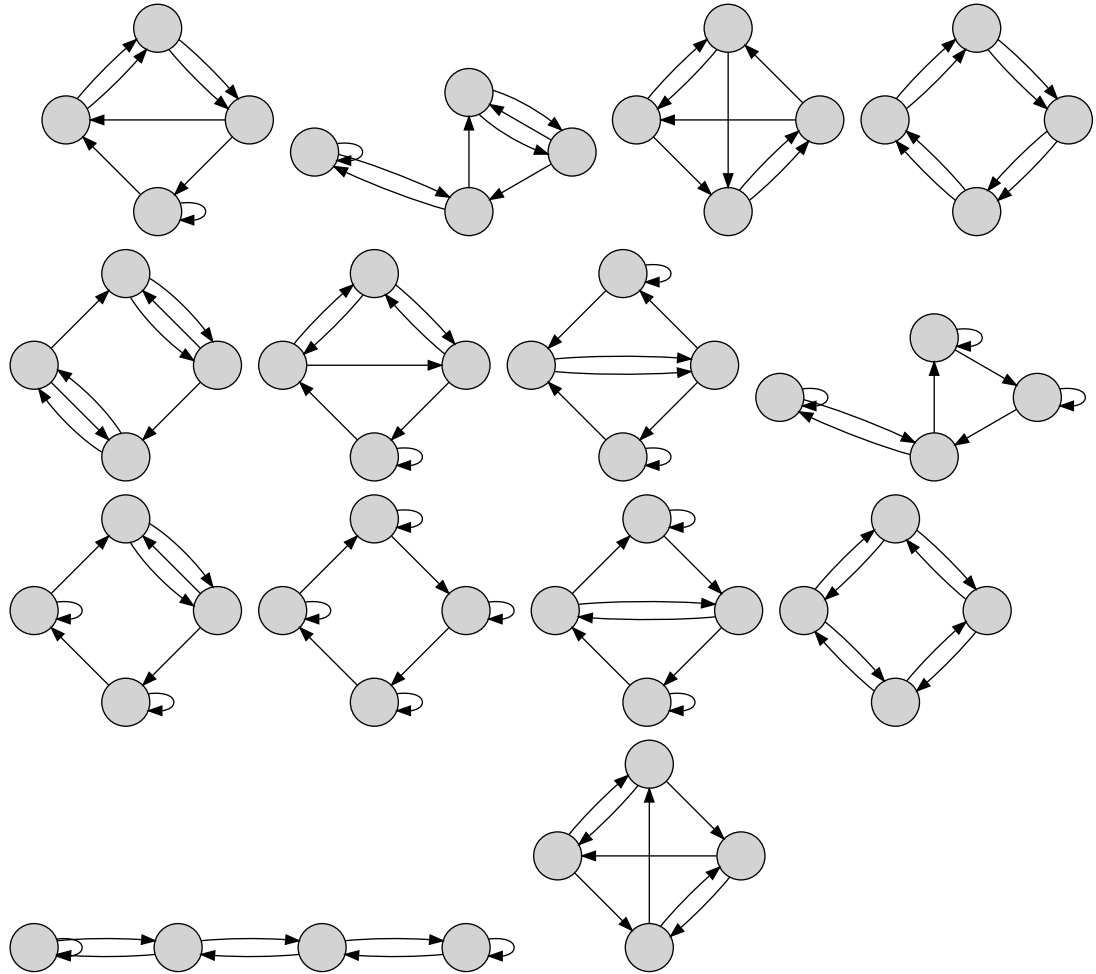


*Date:* March 15, 2019.

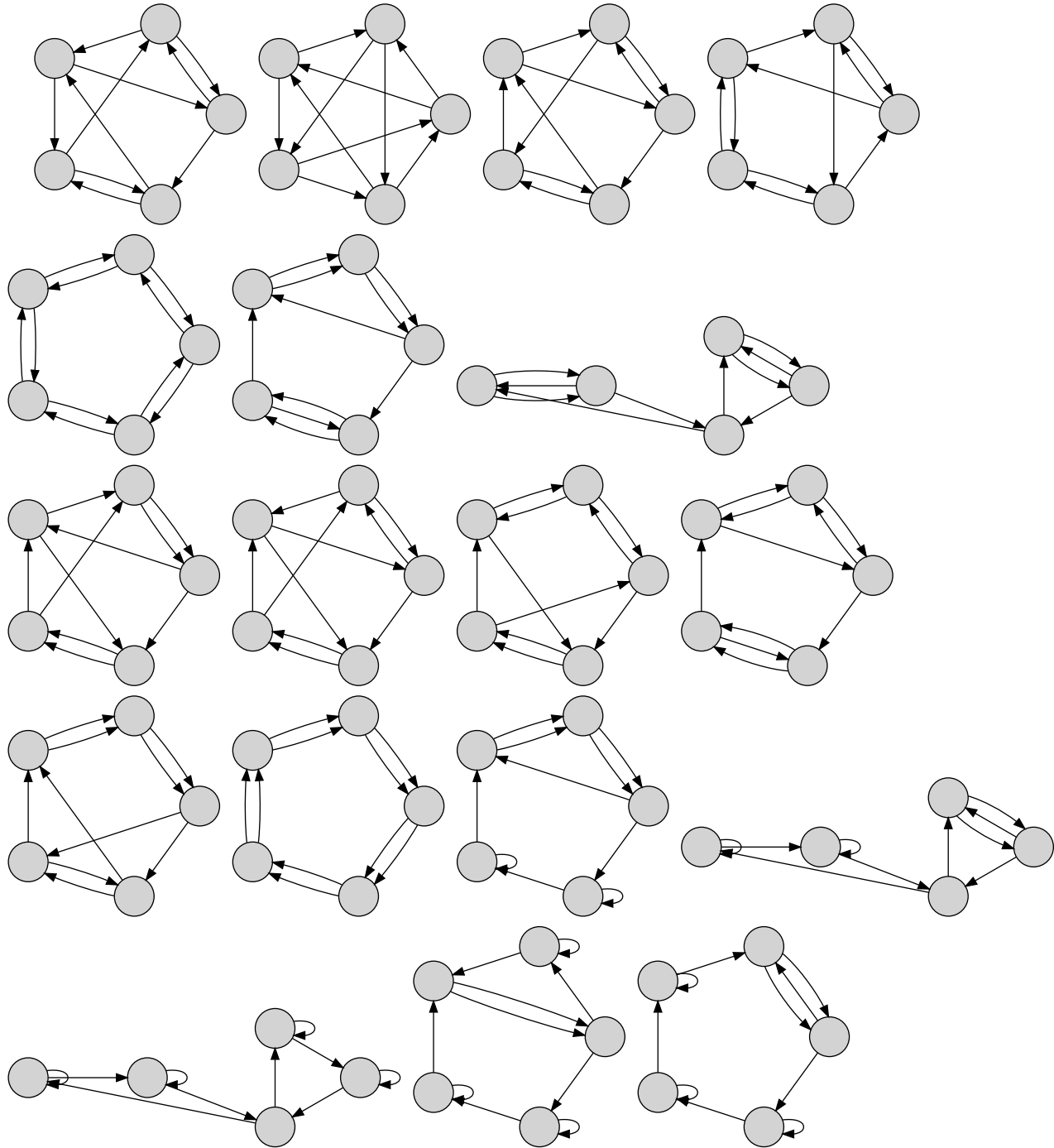
*2010 Mathematics Subject Classification.* 05C20.

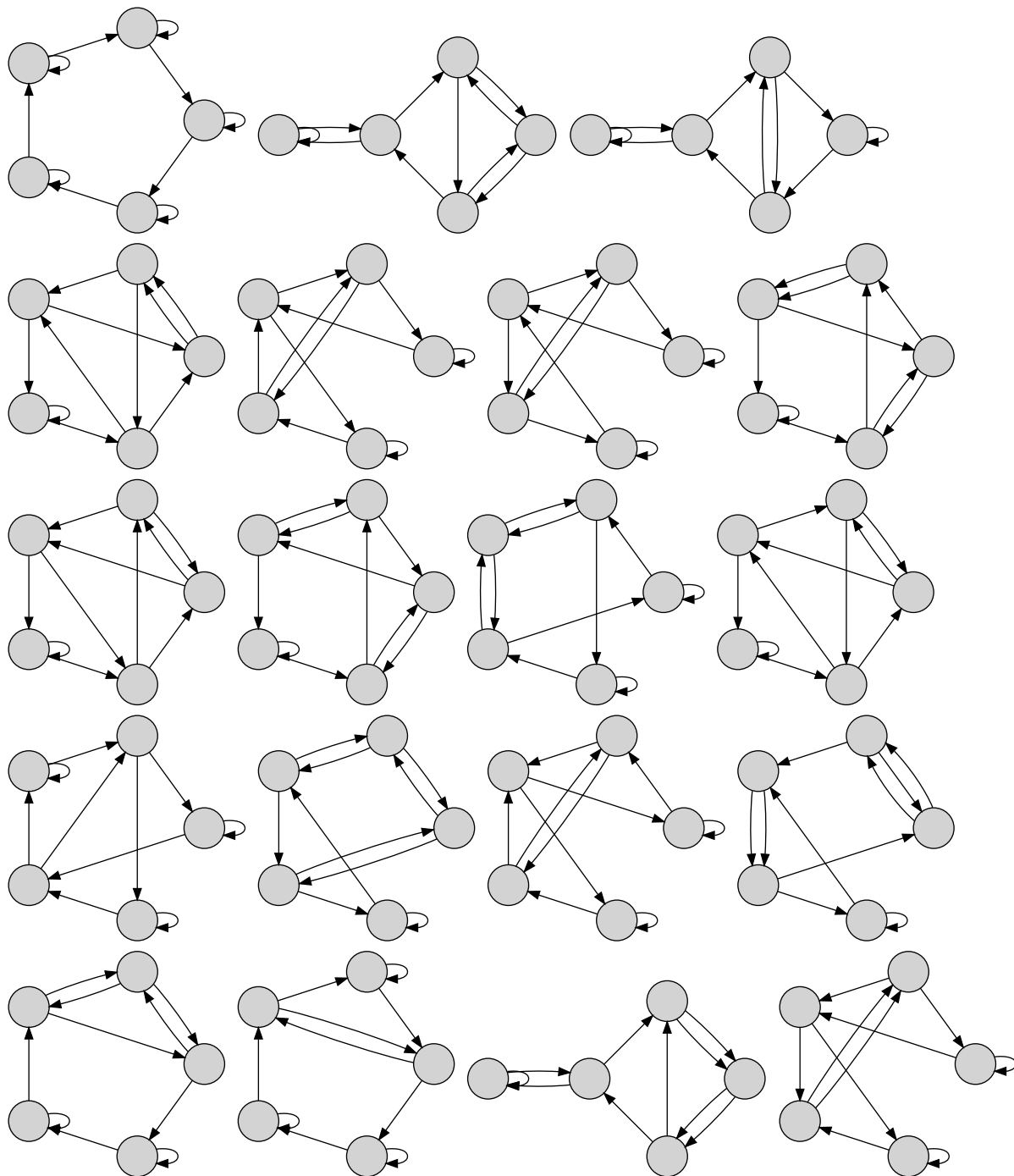
*Key words and phrases.* Combinatorics, Digraphs, regular graphs.

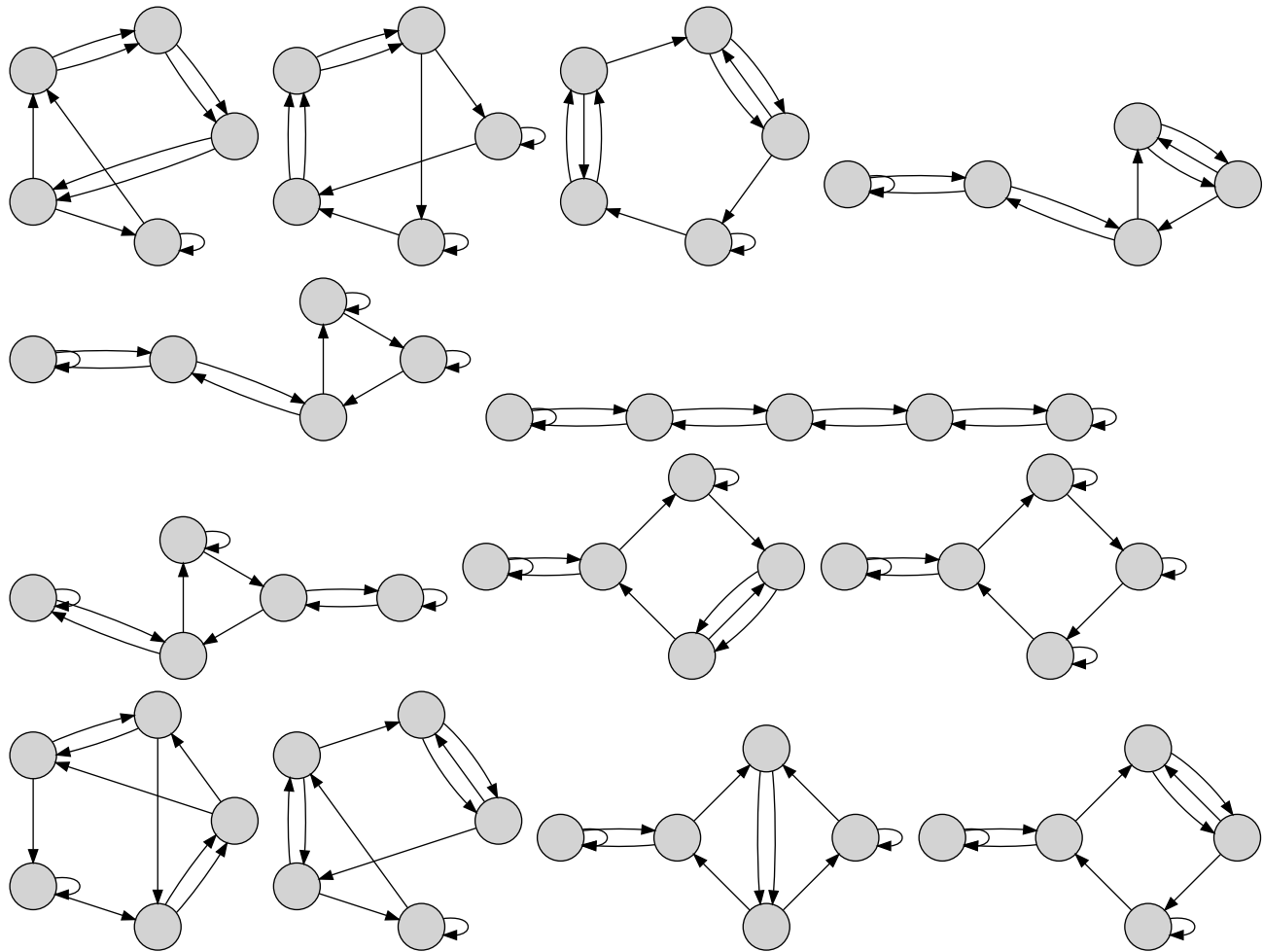
## 25 GRAPHS (14 CONNECTED) ON 4 NODES



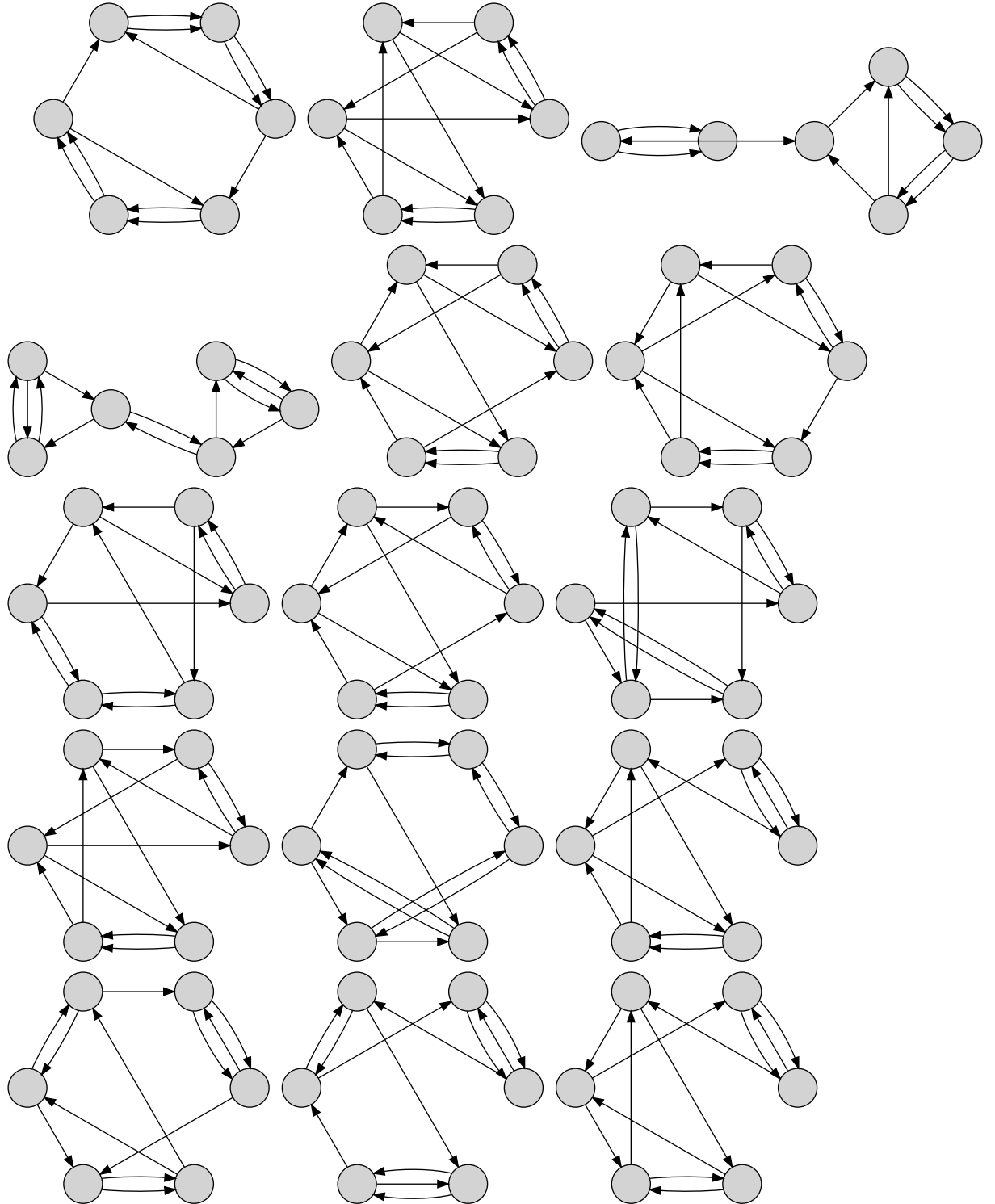
85 GRAPHS (50 CONNECTED) ON 5 NODES

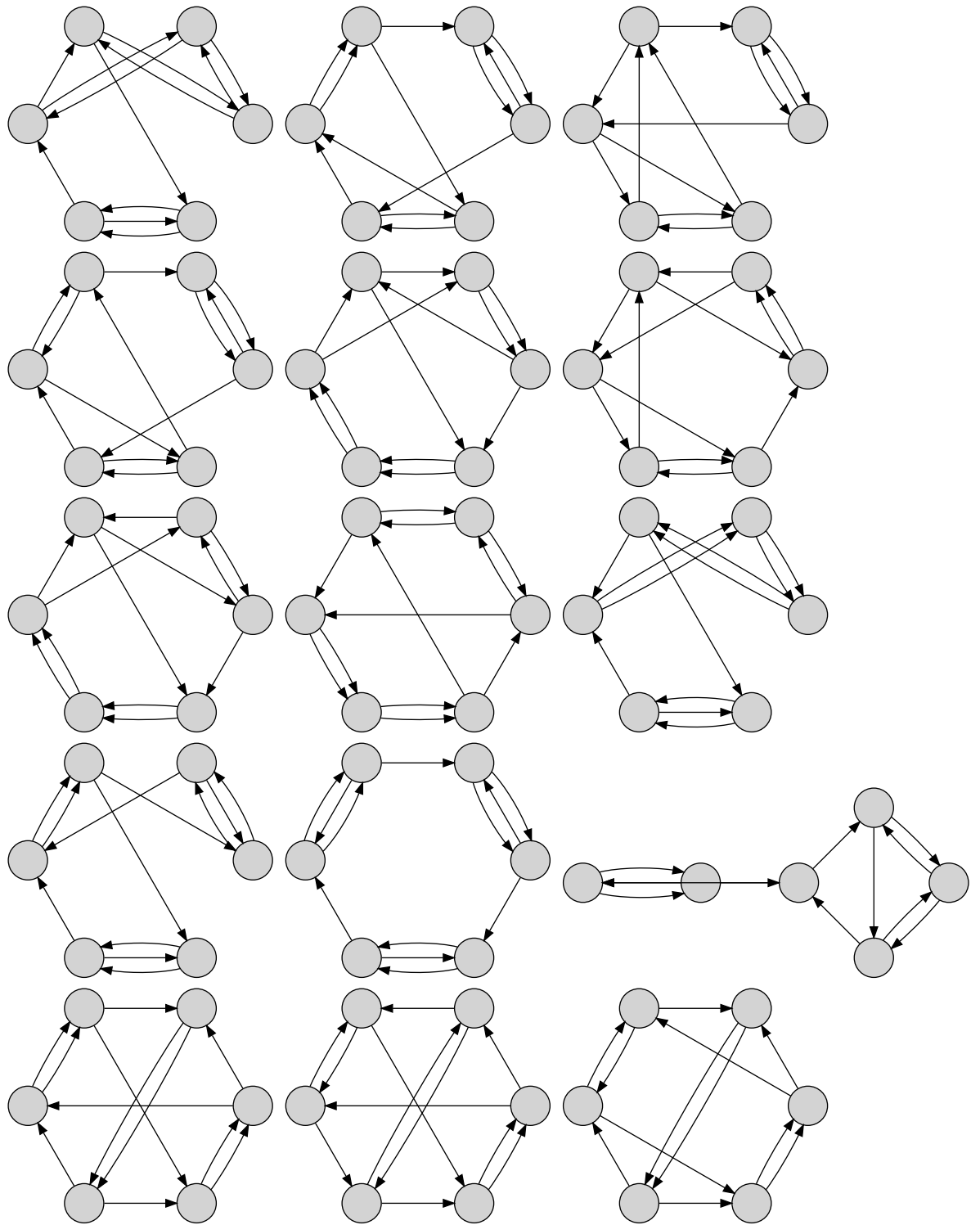


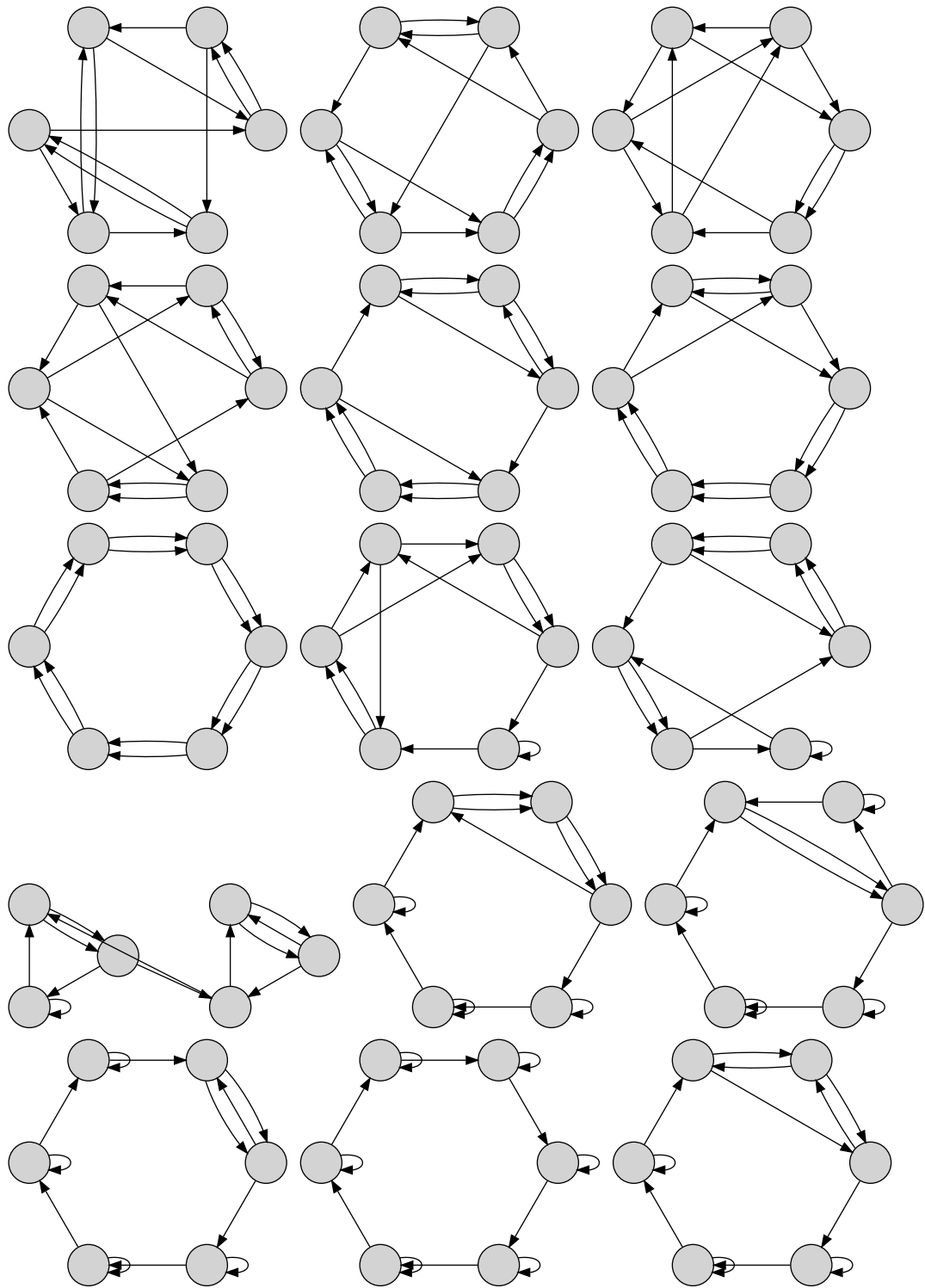




## 397 GRAPHS (265 CONNECTED) ON 6 NODES

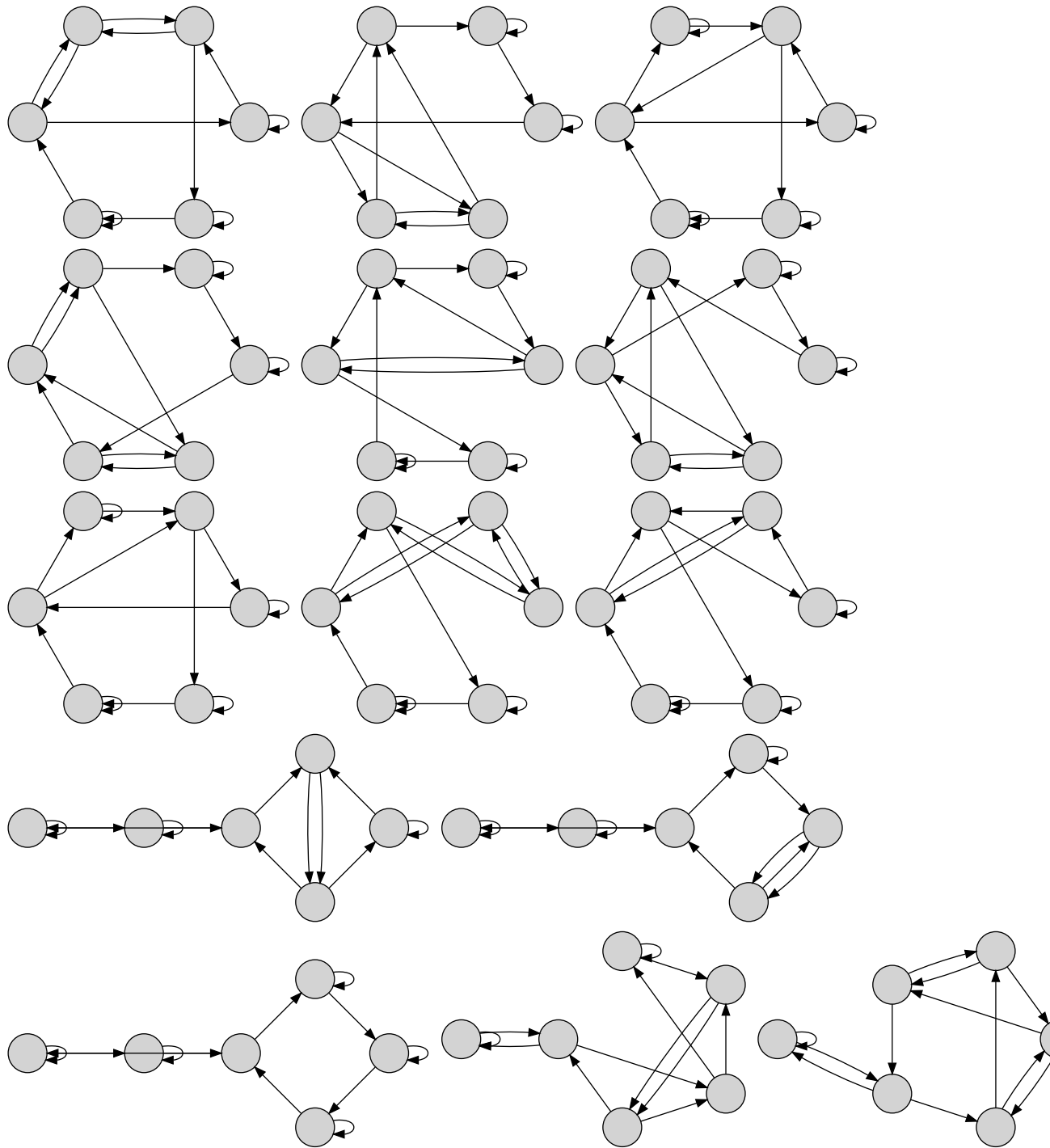


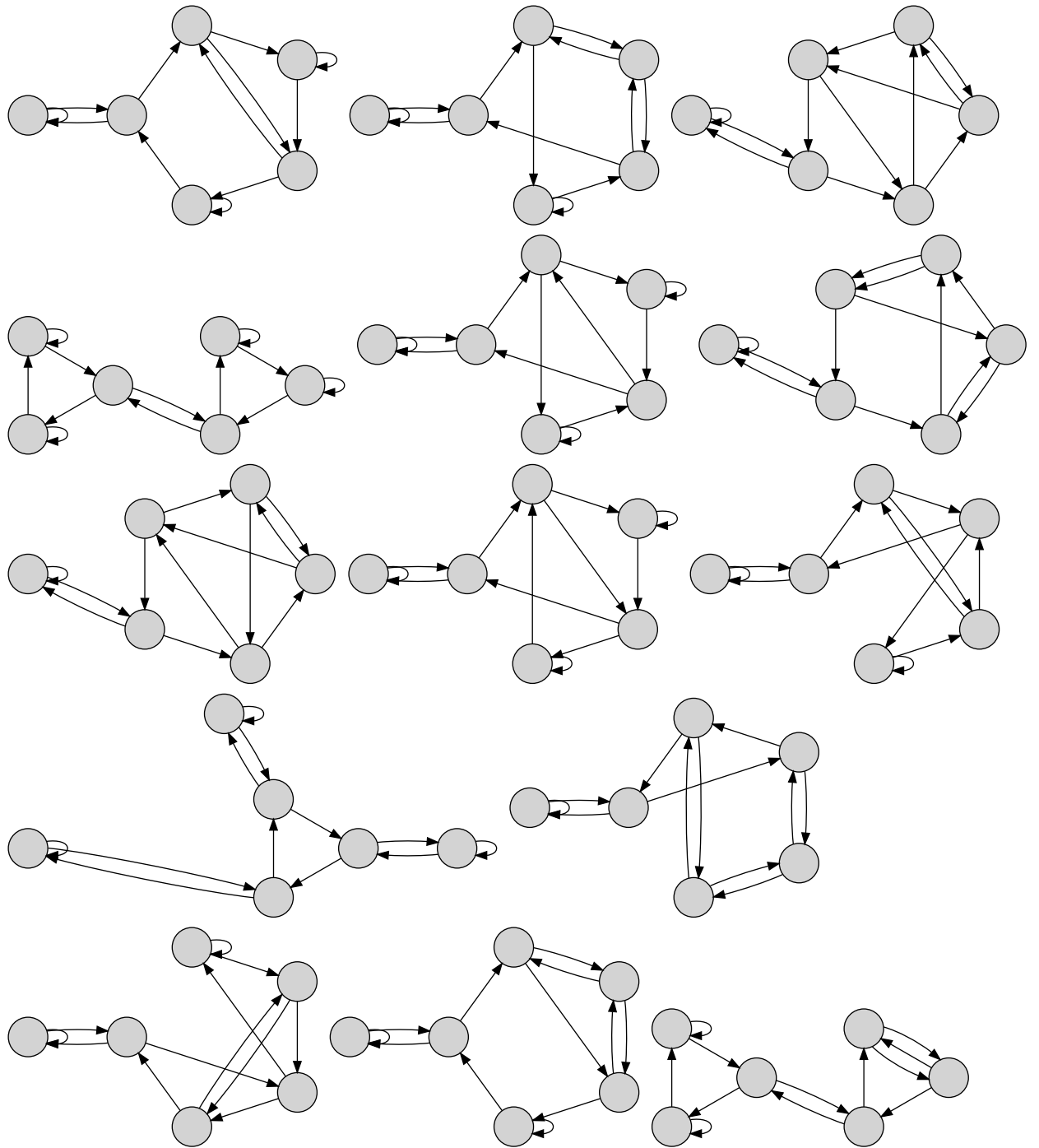


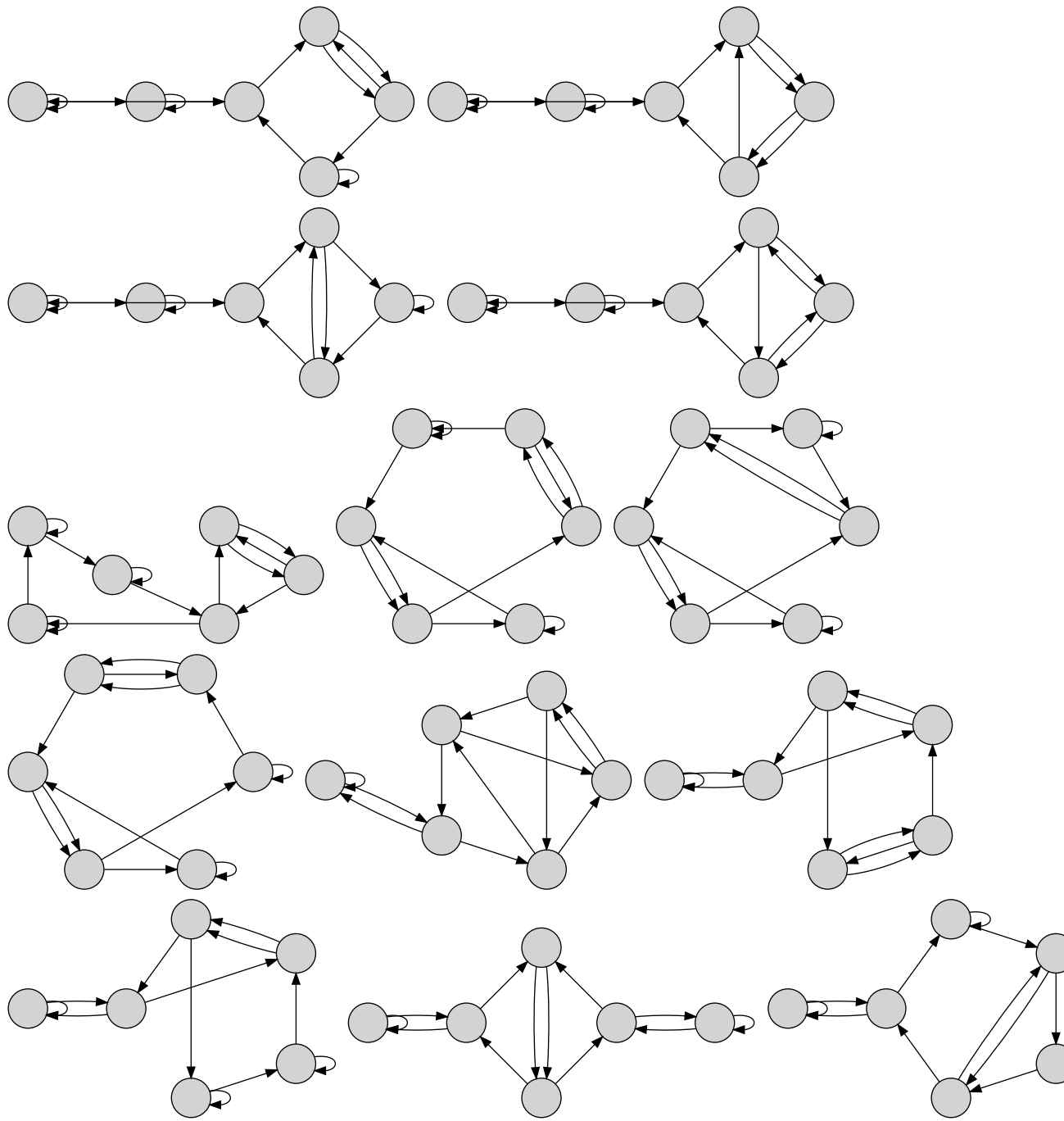


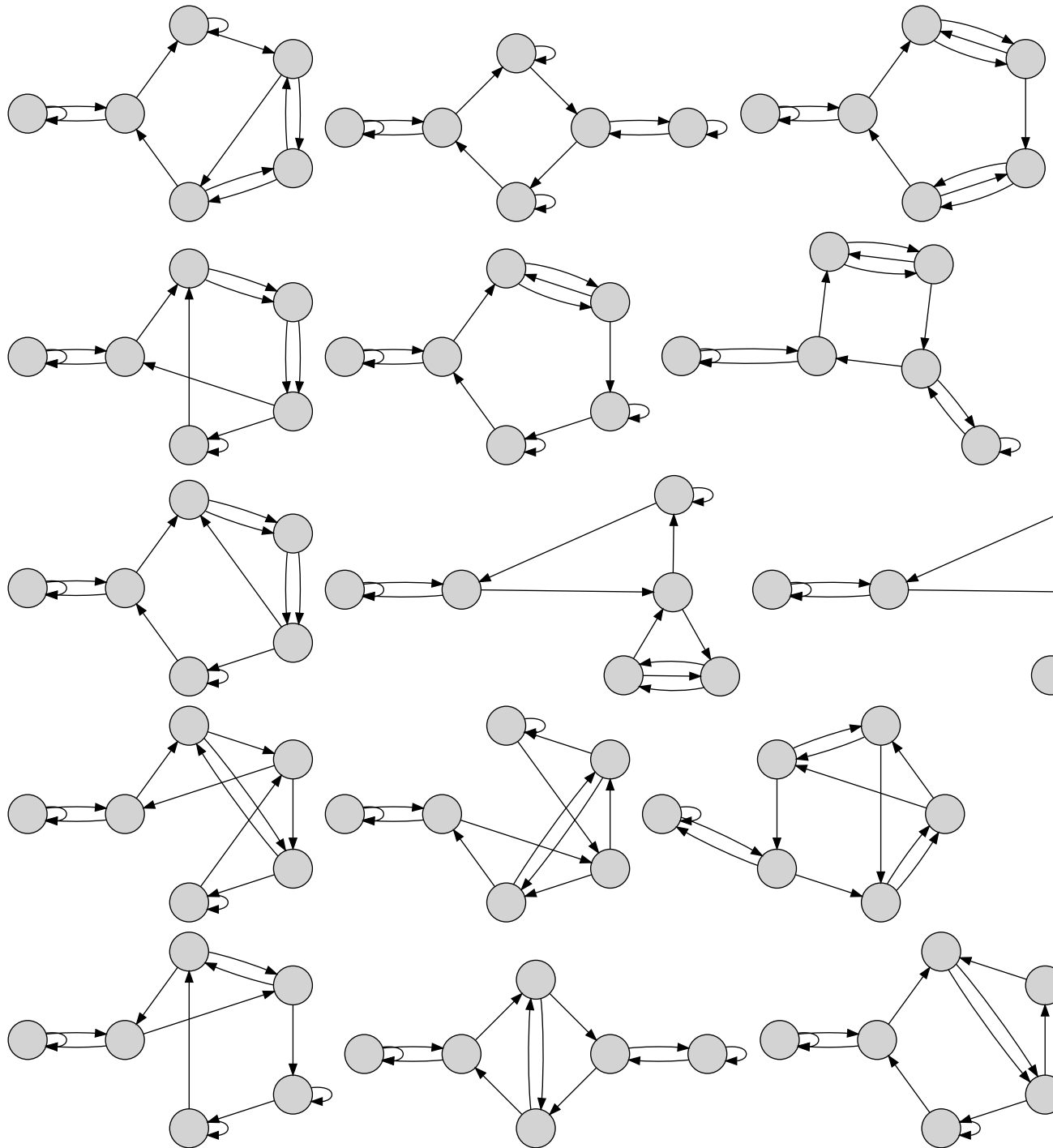


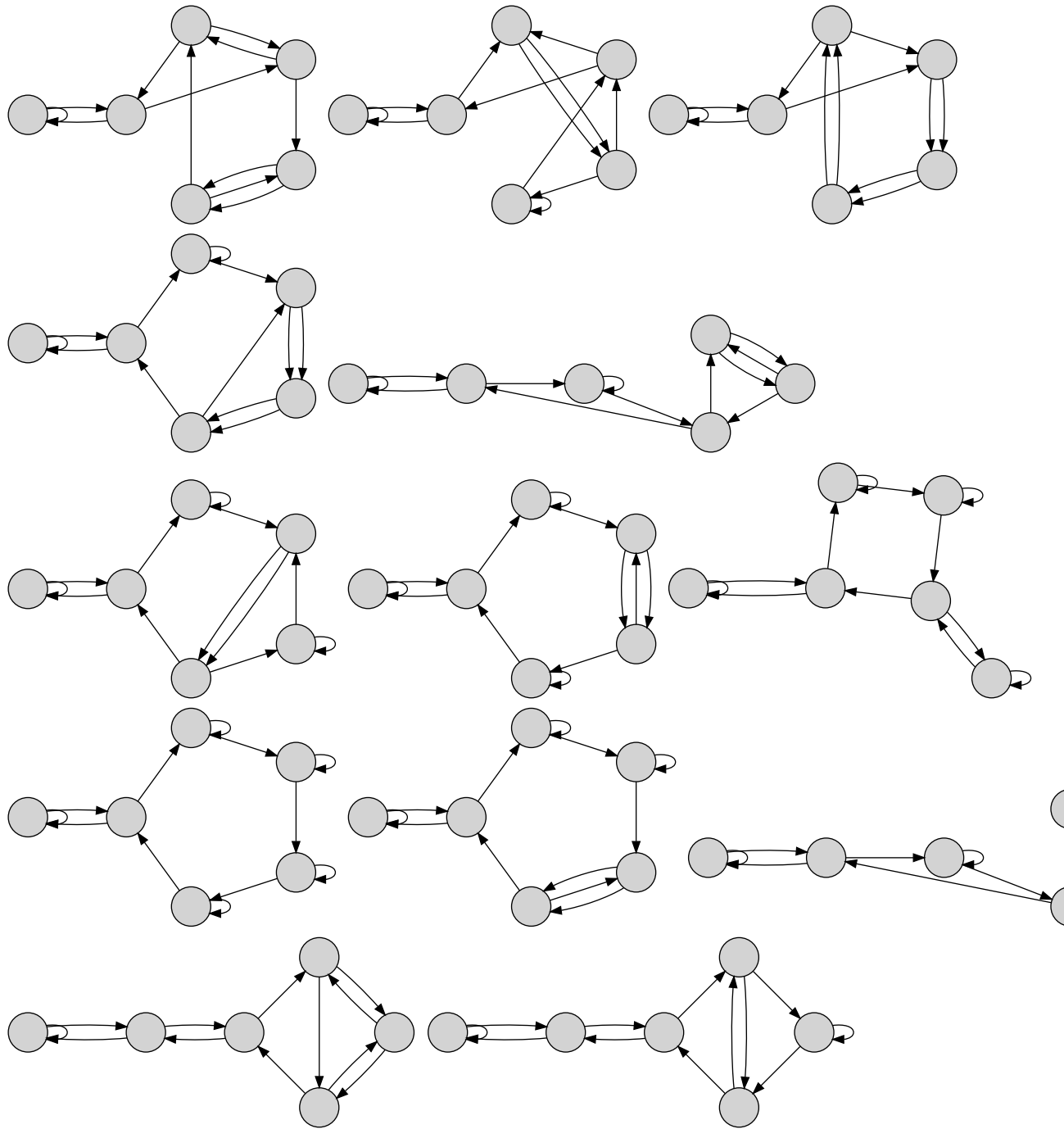


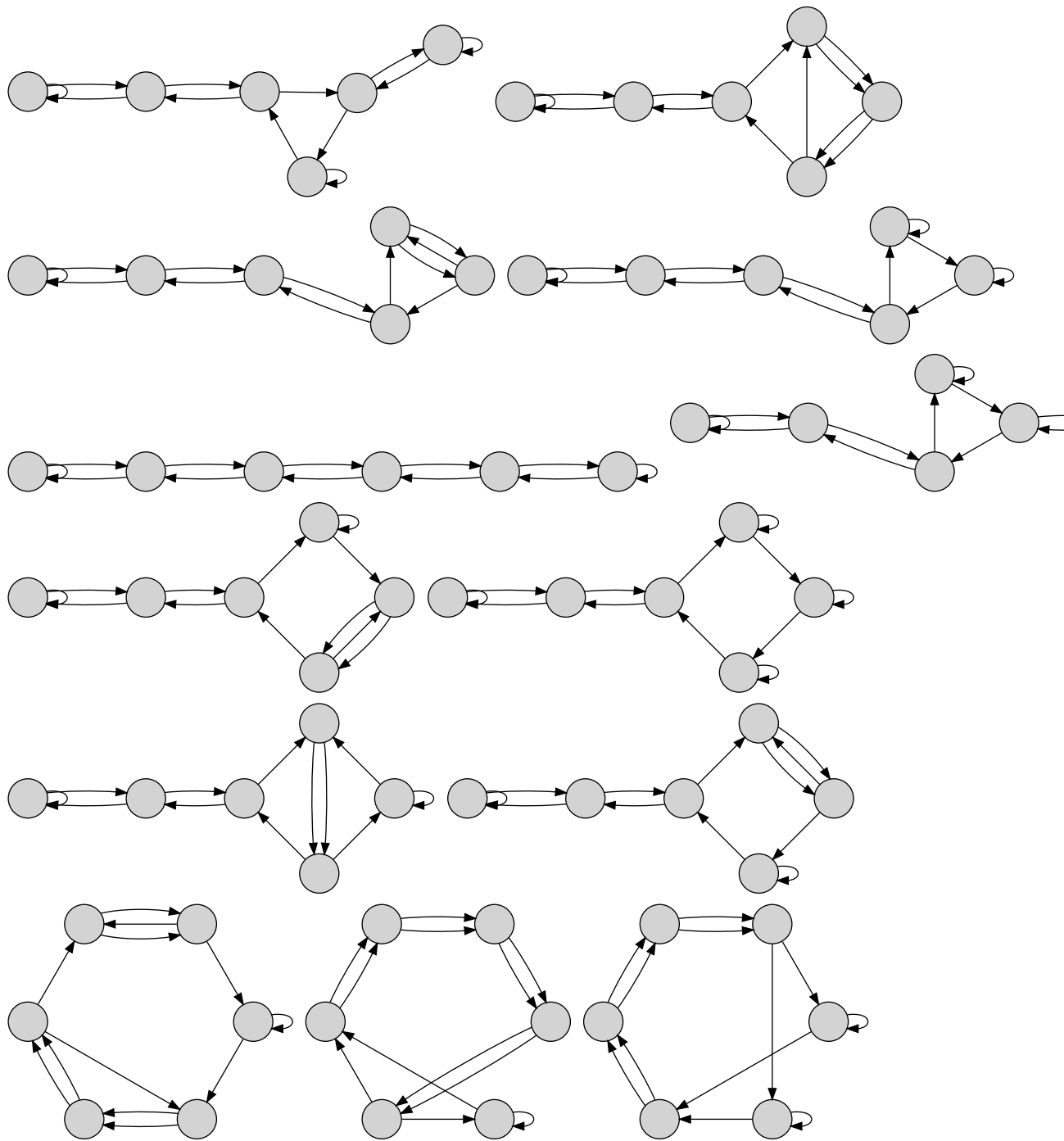


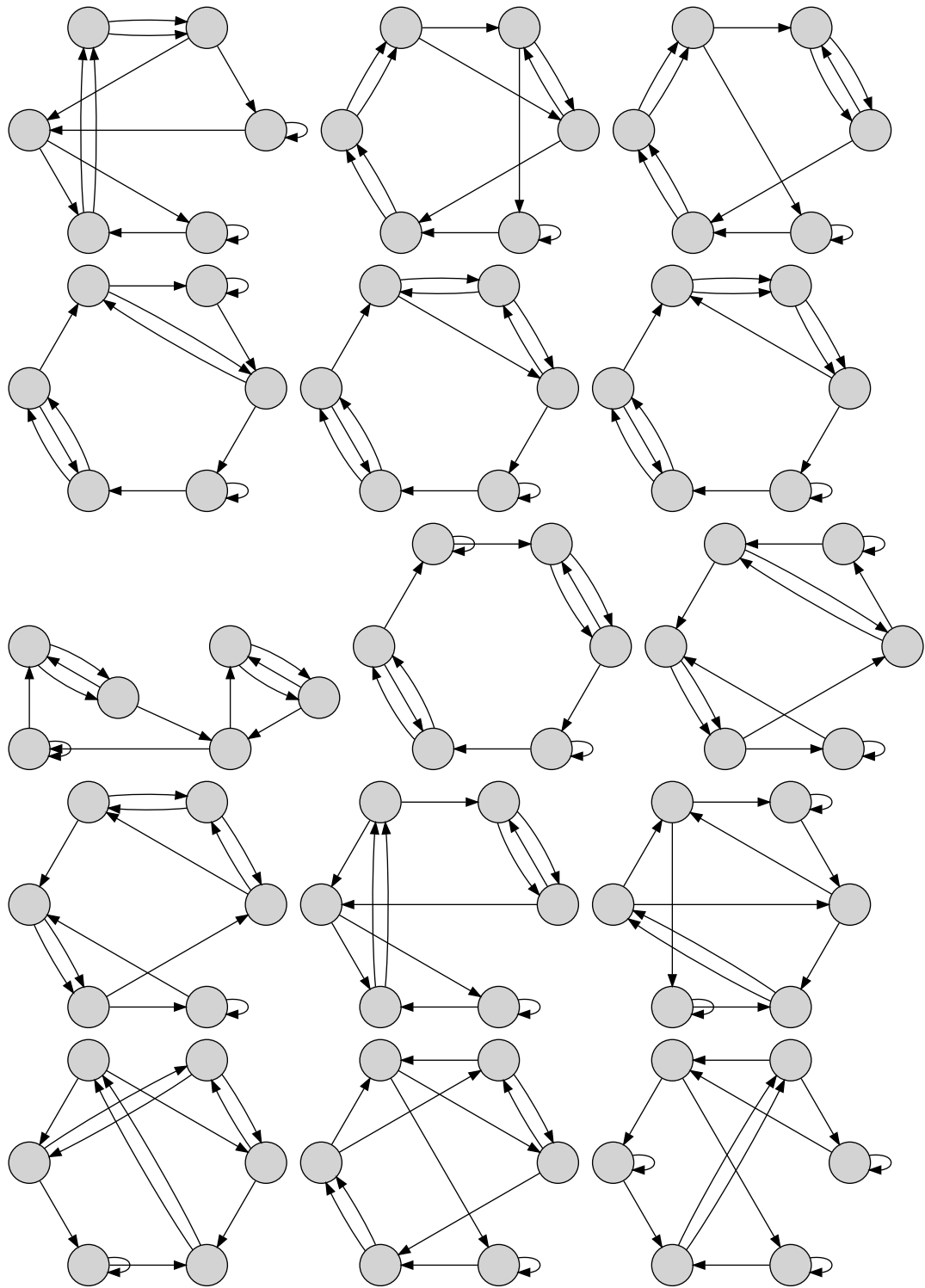




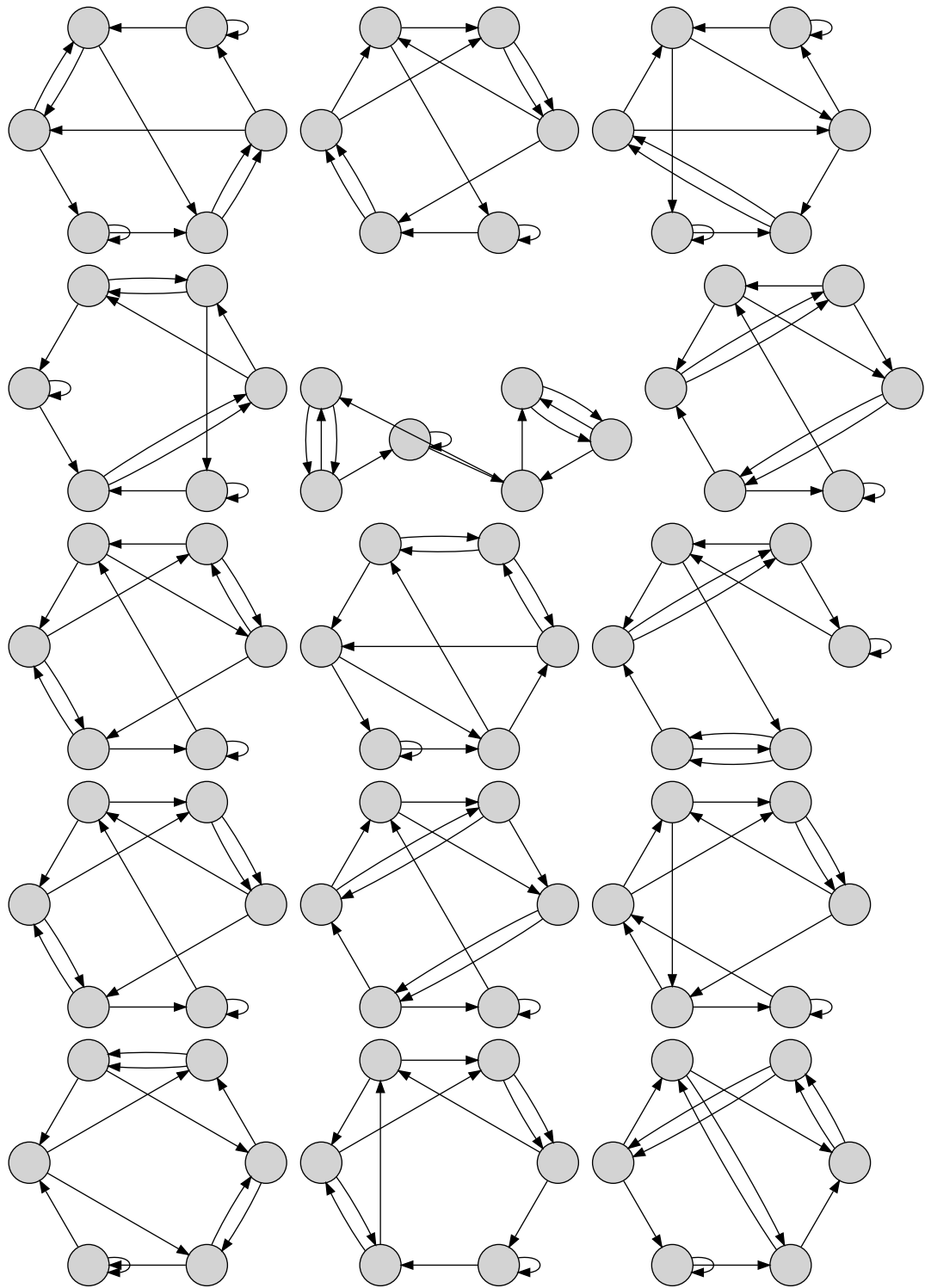


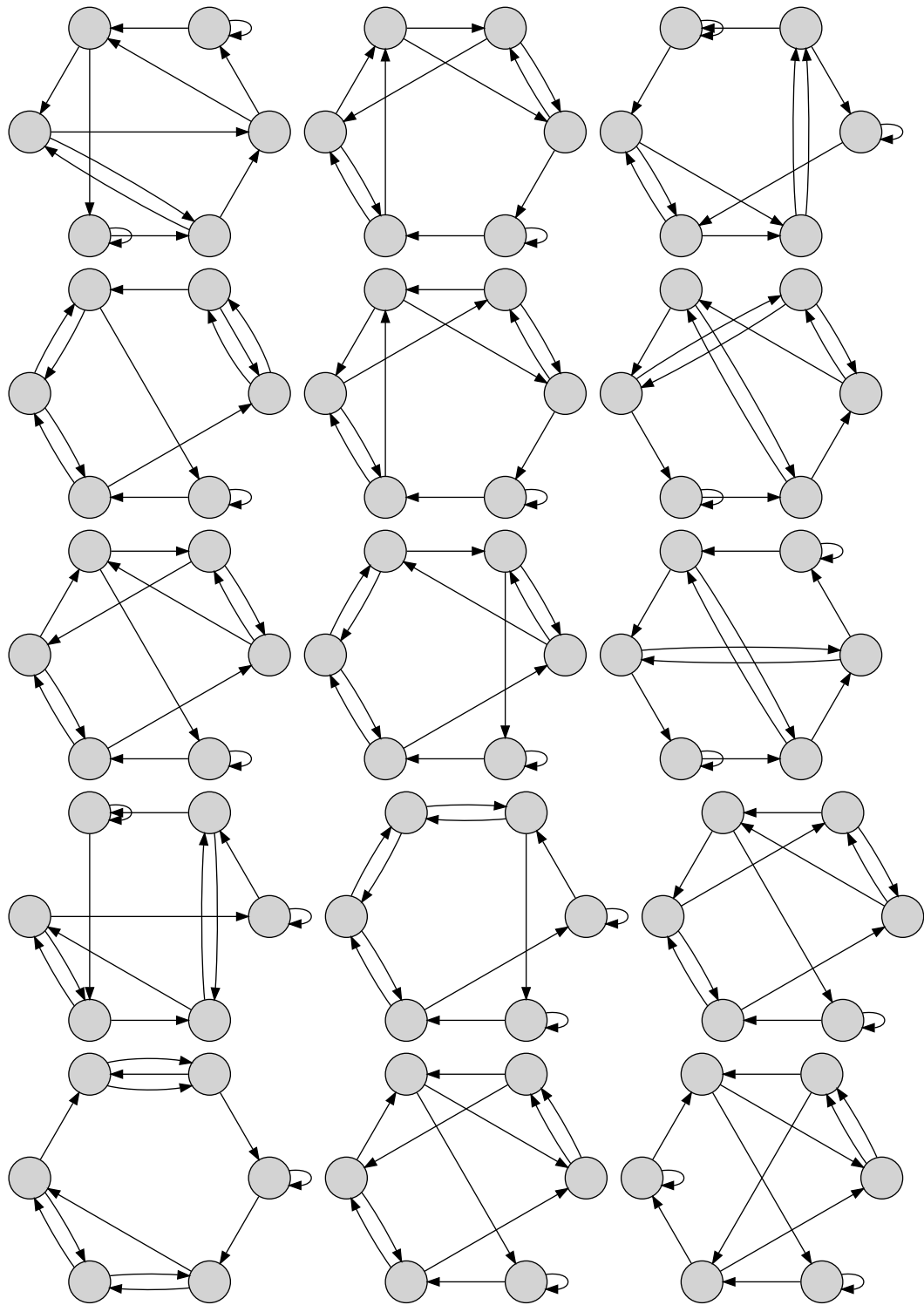


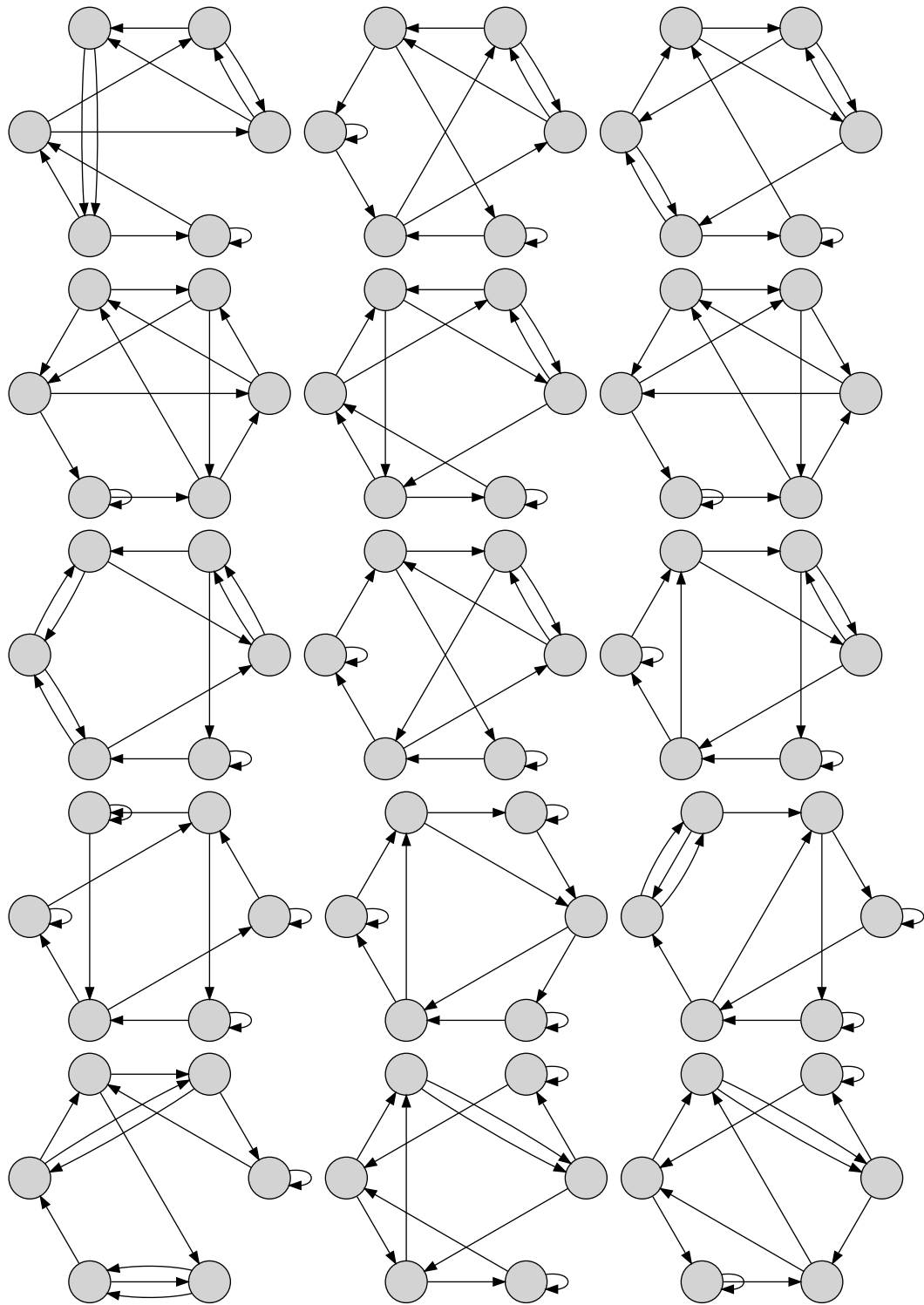


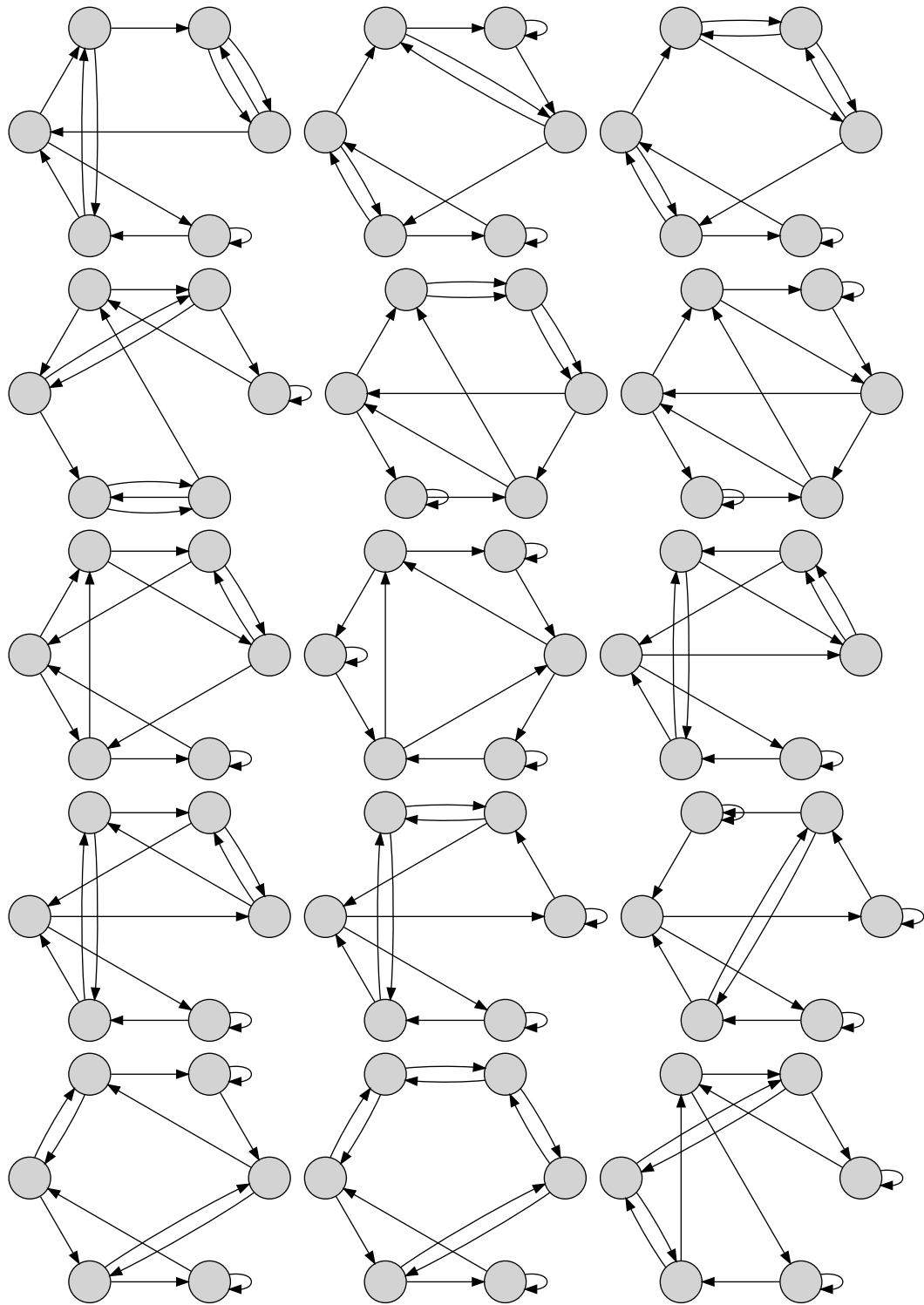


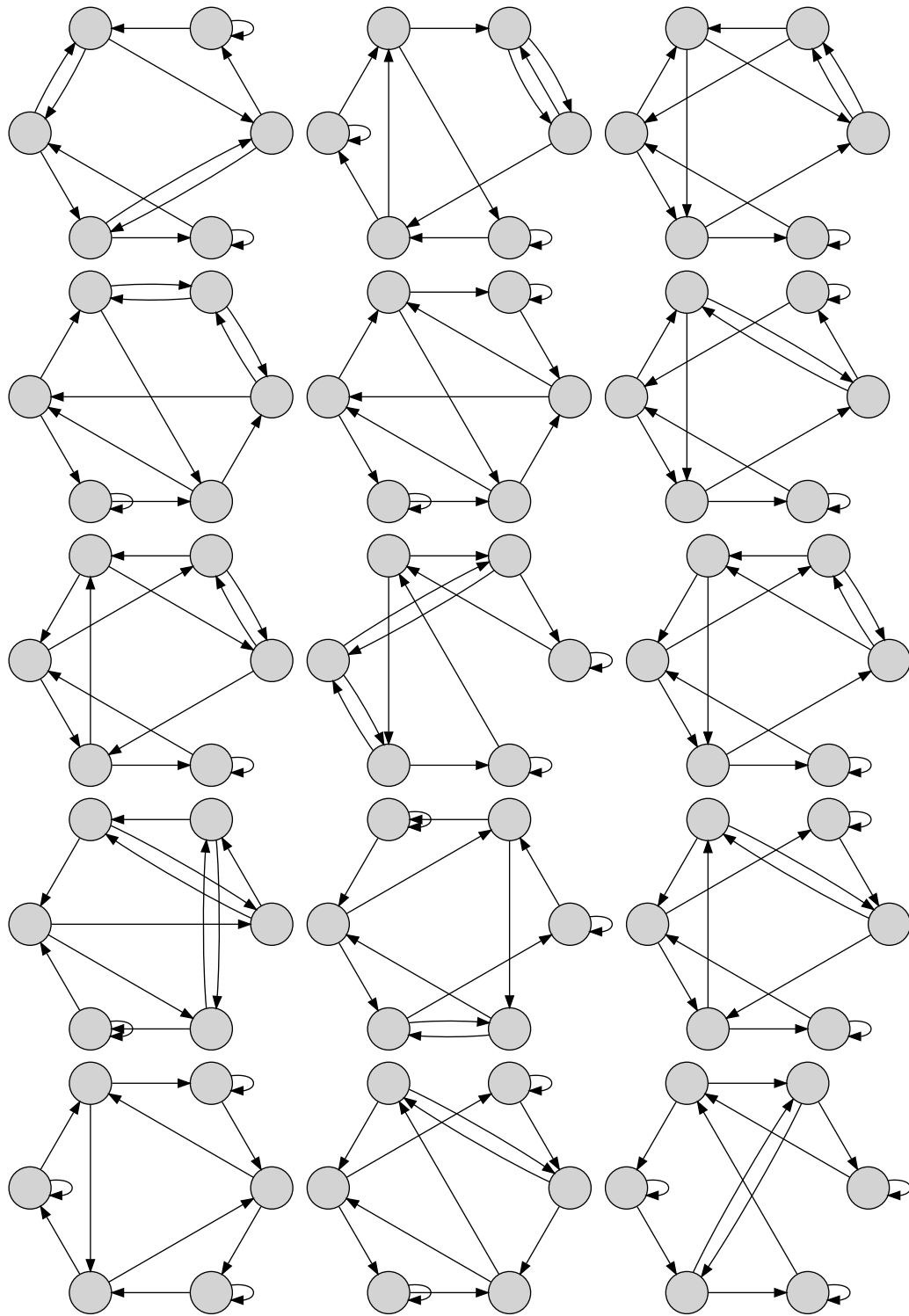


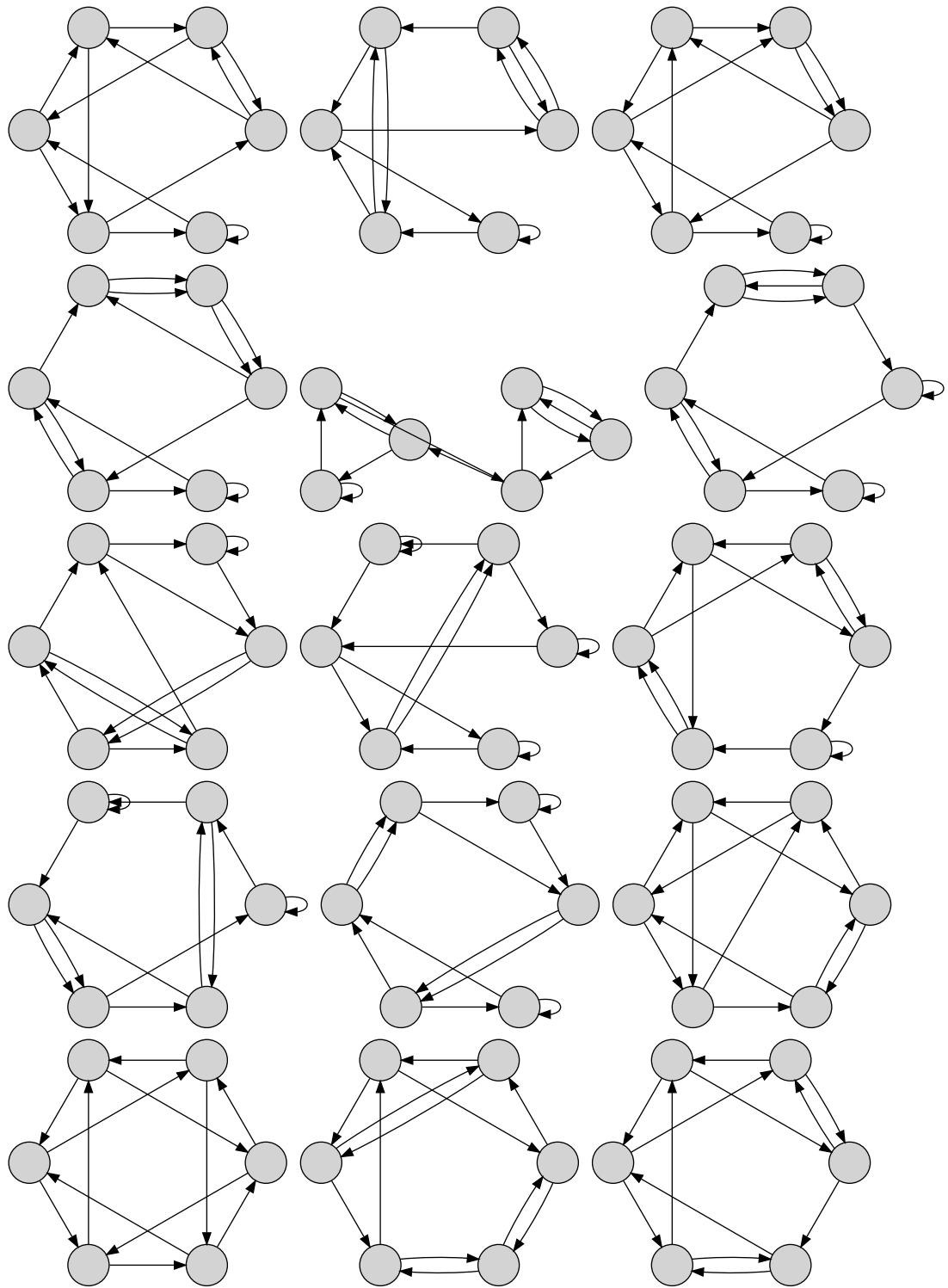




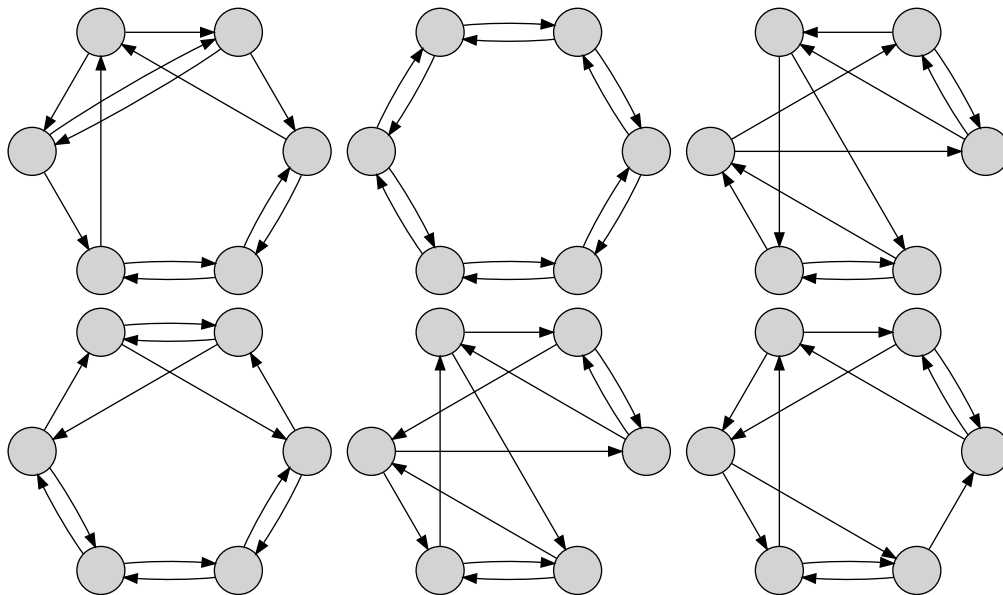












## REFERENCES

1. O. E. I. S. Foundation Inc., *The On-Line Encyclopedia Of Integer Sequences*, (2019), <http://oeis.org/>. MR 3822822
2. Richard J. Mathar, *Feynman diagrams of the QED vacuum polarization*, vixra:1809.0148 (2019).  
 URL: <http://www.mpia-hd.mpg.de/~mathar>

MAX-PLANCK INSTITUTE OF ASTRONOMY, KÖNIGSTUHL 17, 69117 HEIDELBERG, GERMANY