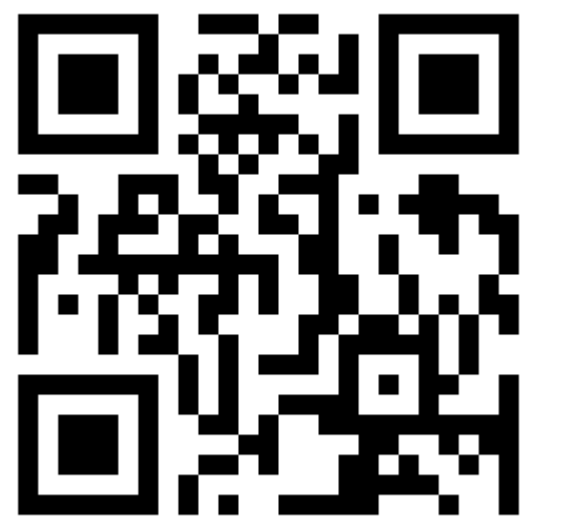


# L-Visibility Drawings of IC-planar Graphs

Giuseppe Liotta      Fabrizio Montecchiani

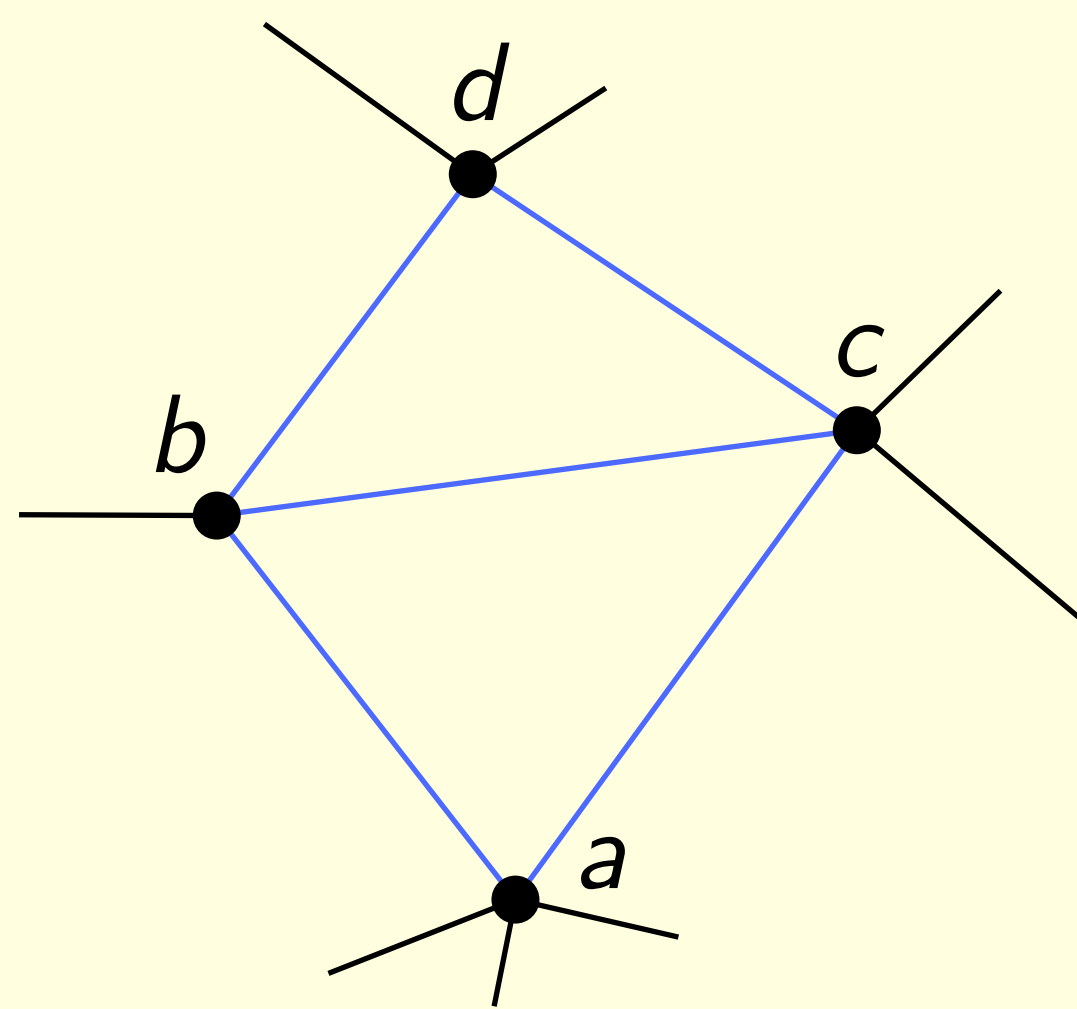
Università degli Studi di Perugia

{giuseppe.liotta,fabrizio.montecchiani}@unipg.it

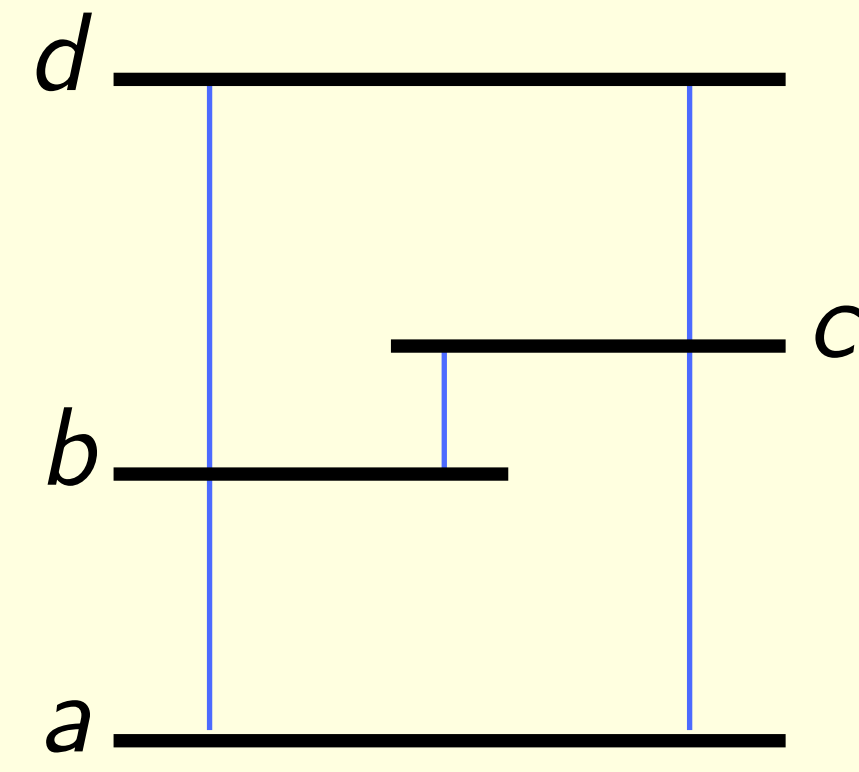


full version

Motivation



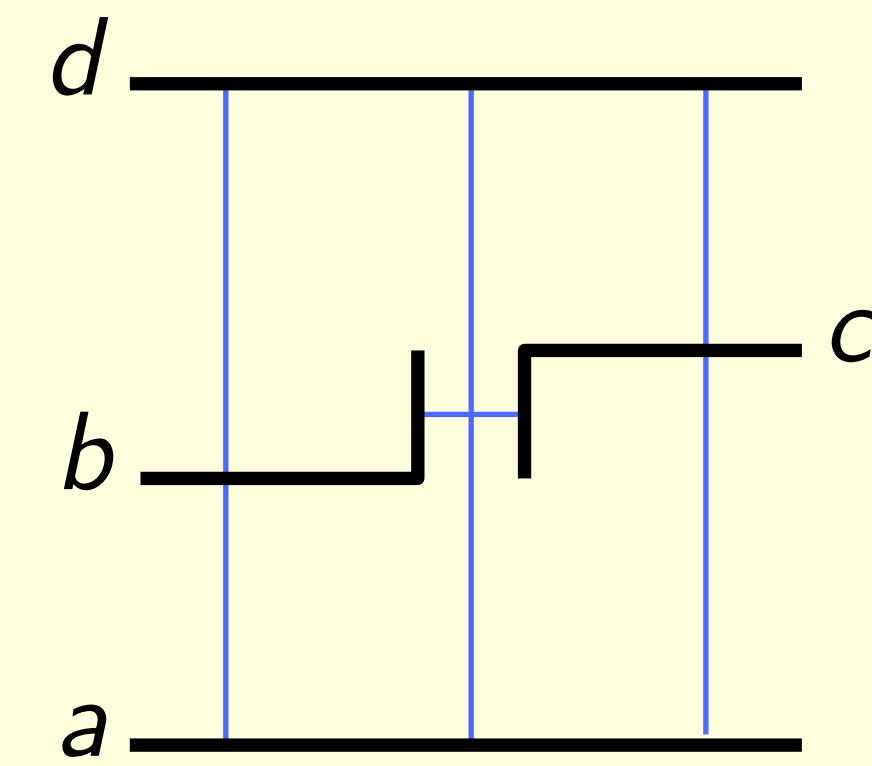
Planar Graph



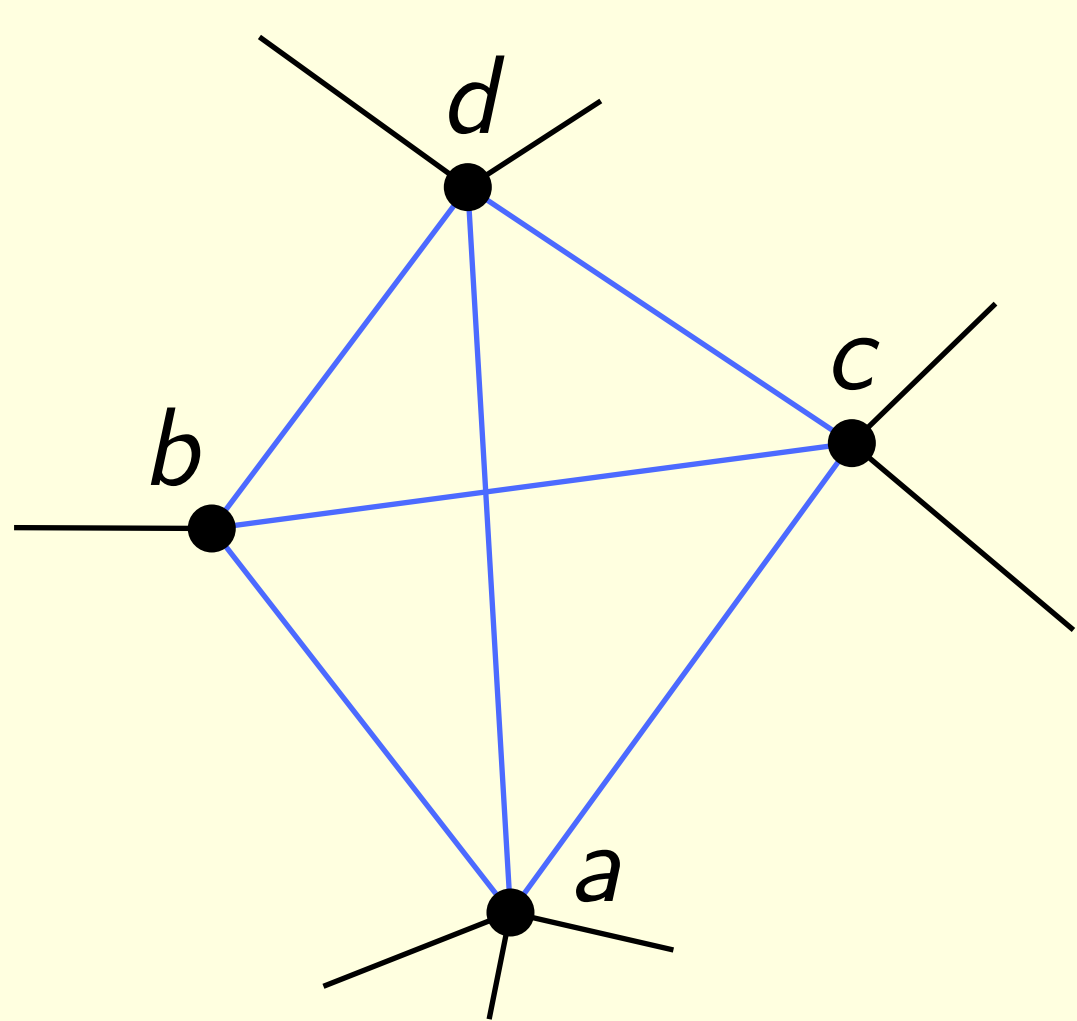
Visibility Drawing [7]

L-Visibility Drawing:

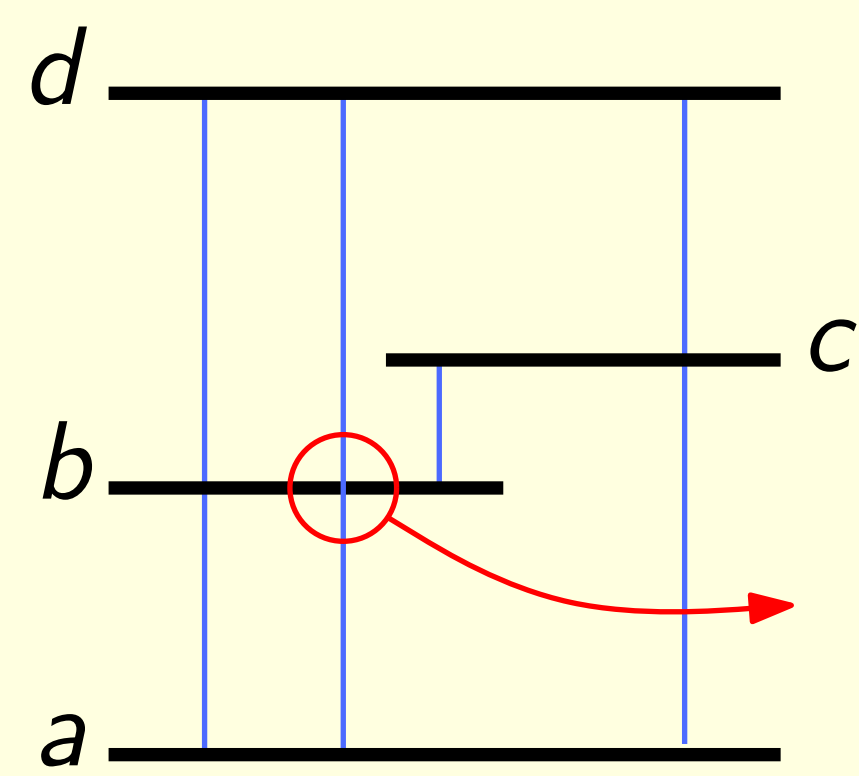
- Vertices = L-shapes
- Edges = Horizontal/Vertical Visibilities
- Crossings occur only between edges



L-Visibility Drawing [4]



1-Planar Graph



Edge/Vertex crossing:  
bad for readability

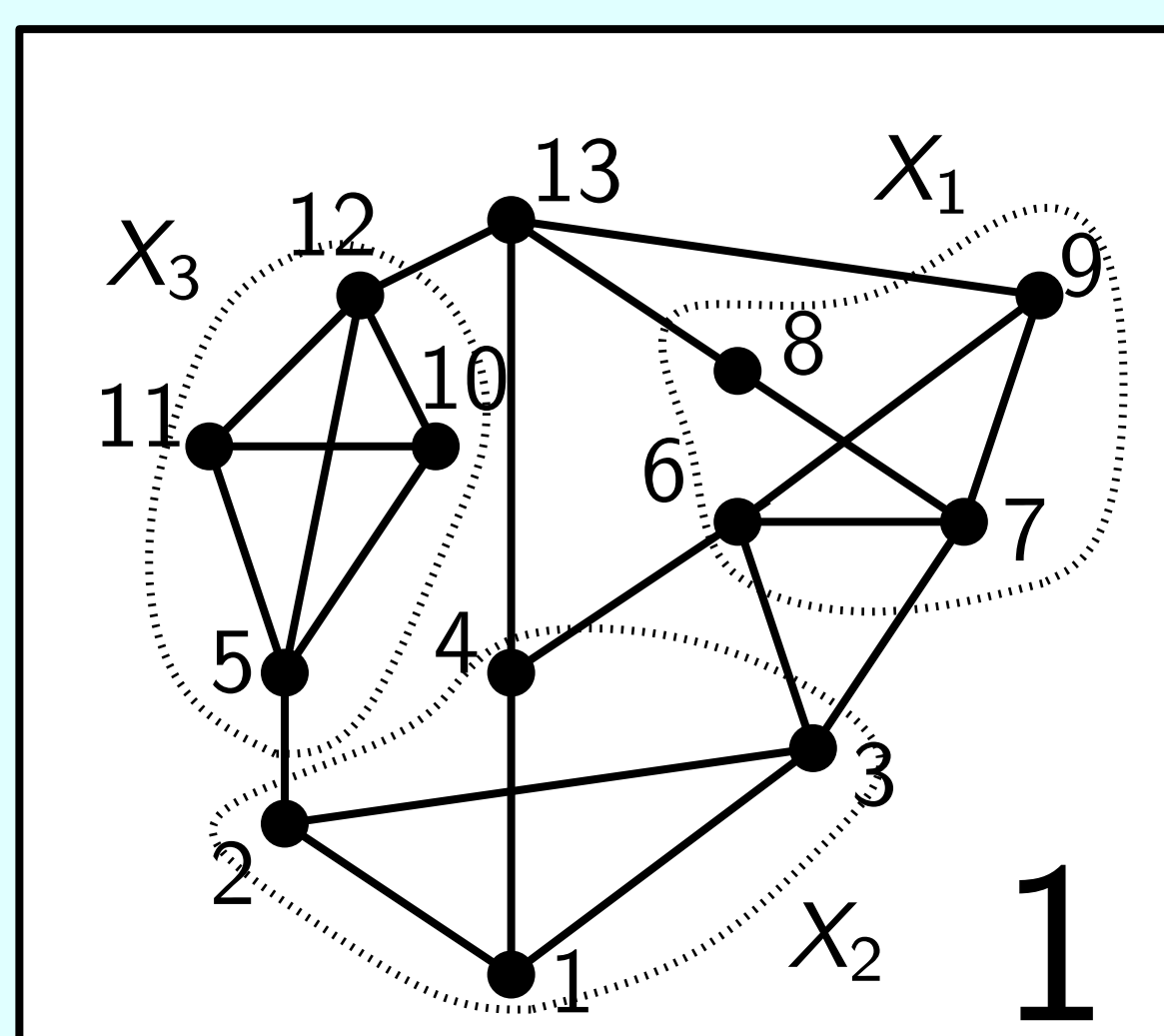
Bar 1-Visibility Drawing [1,3]

IC-planar graphs: 1-planar graphs such that any two crossed edges do not share an end-vertex [2,5,8].

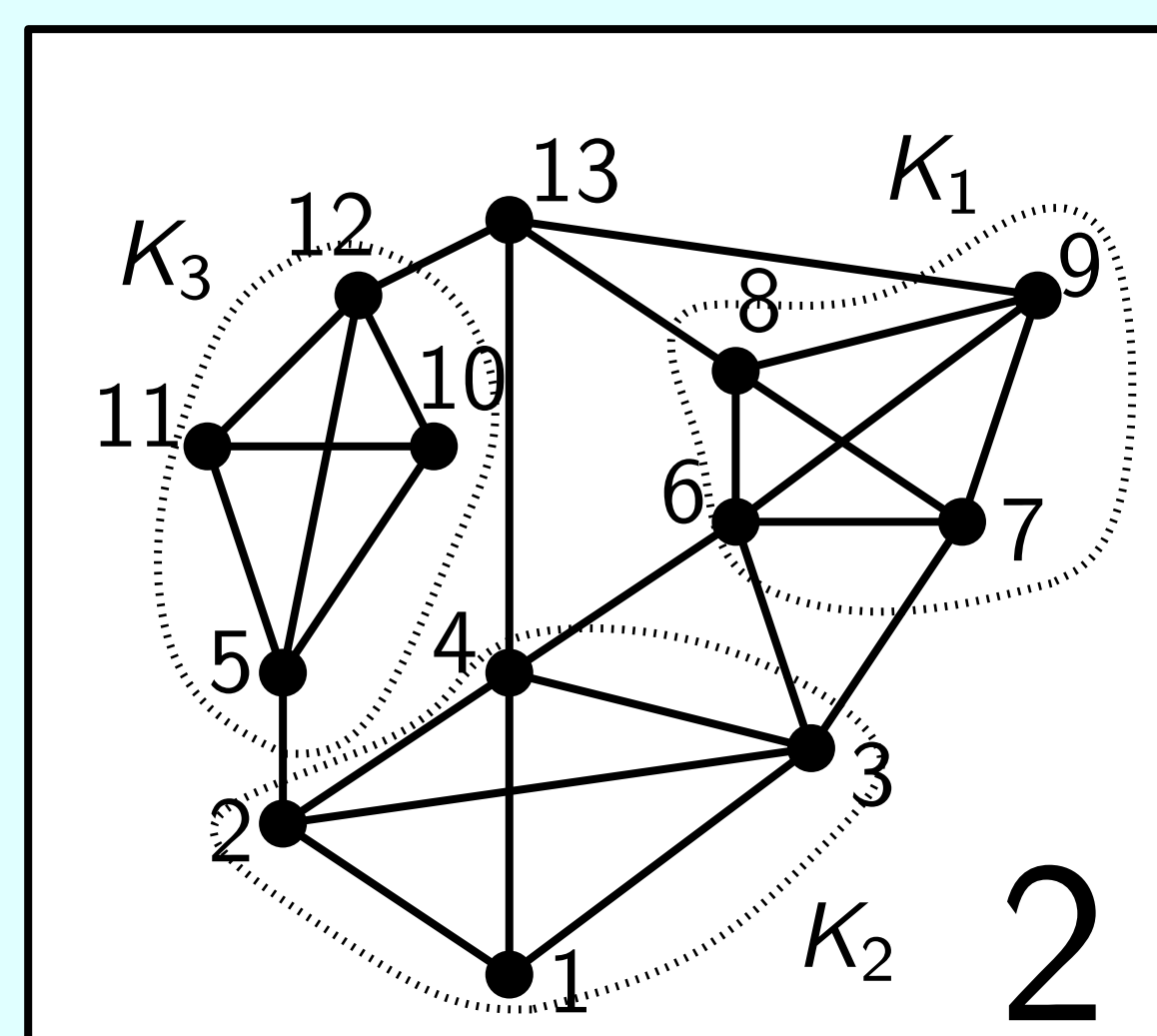
**Theorem 1:** Every  $n$ -vertex IC-plane graph admits an L-visibility drawing in  $O(n^2)$  area, which can be constructed in  $O(n)$  time.

**Corollary 1:** Every  $n$ -vertex IC-plane graph admits a RAC drawing with at most two bends per edge in  $O(n^2)$  area, which can be constructed in  $O(n)$  time.

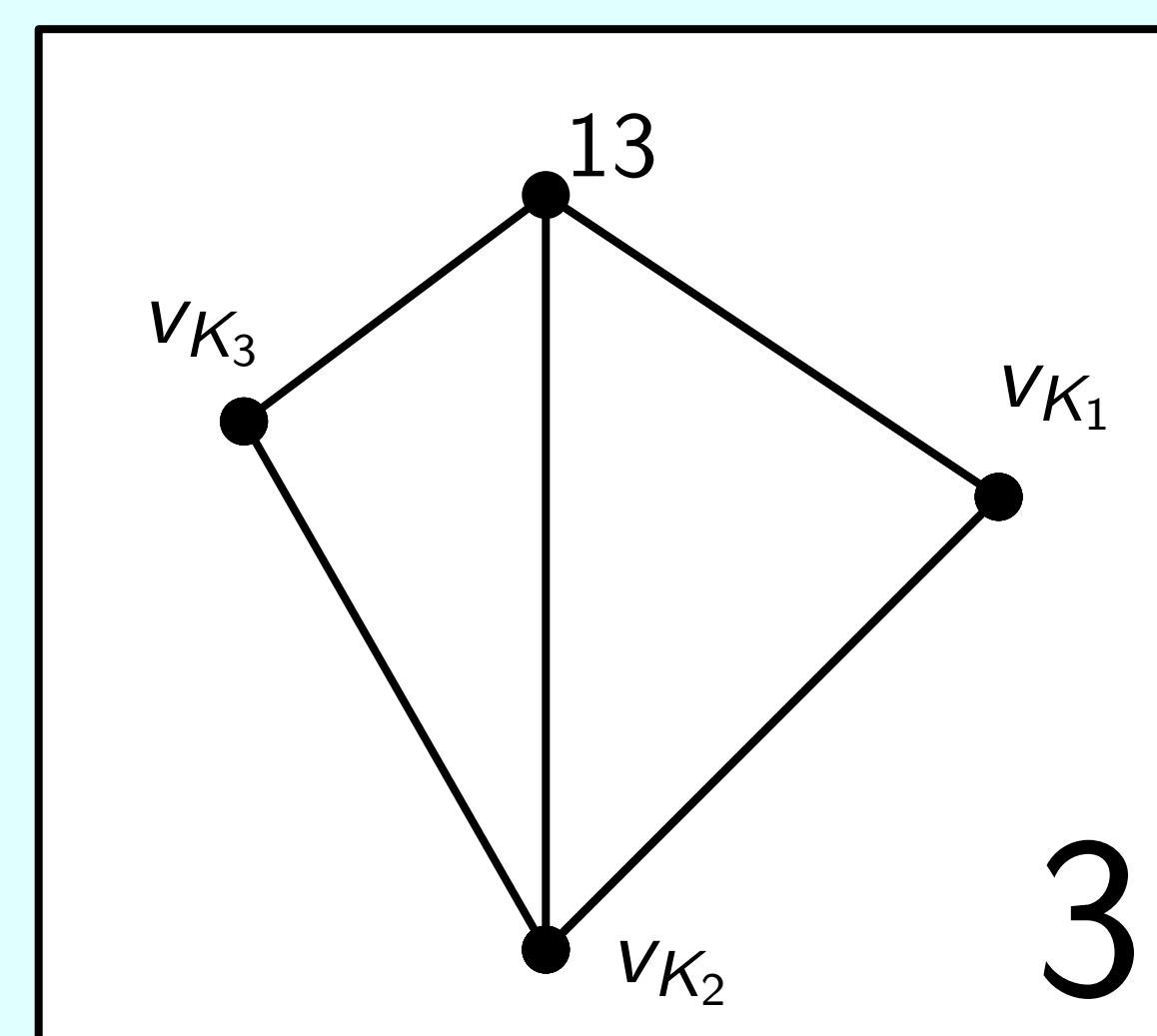
Results



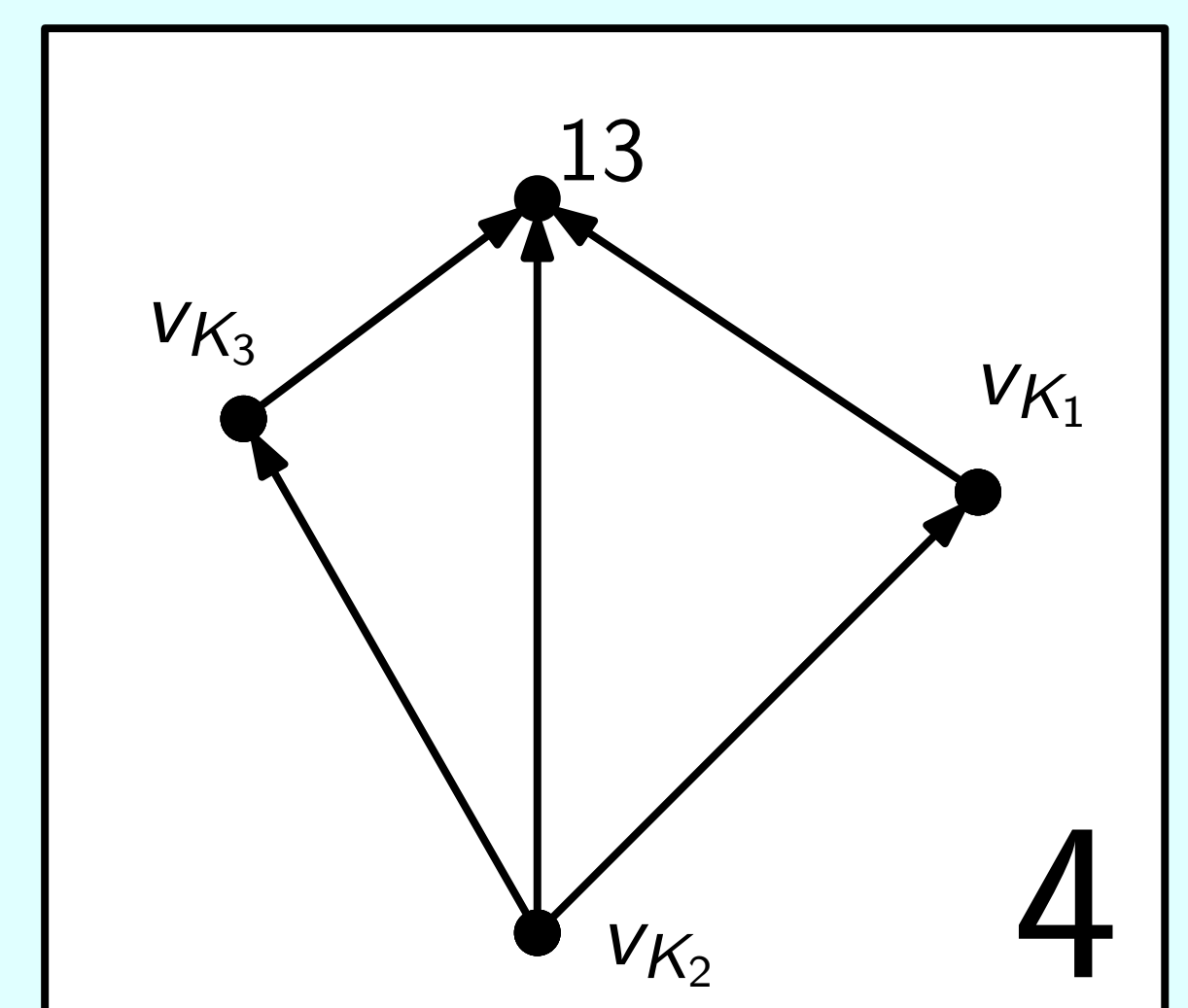
1



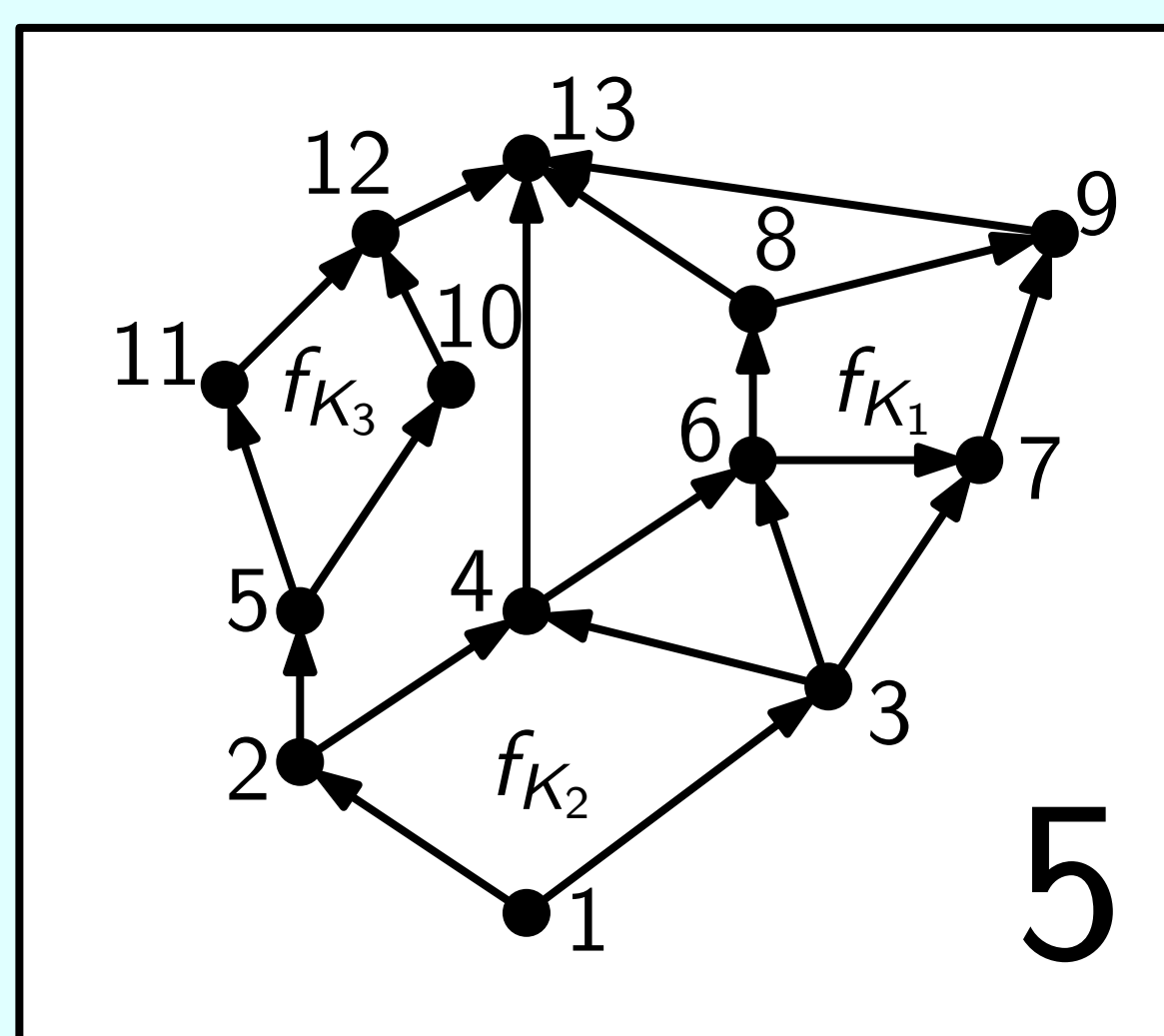
2



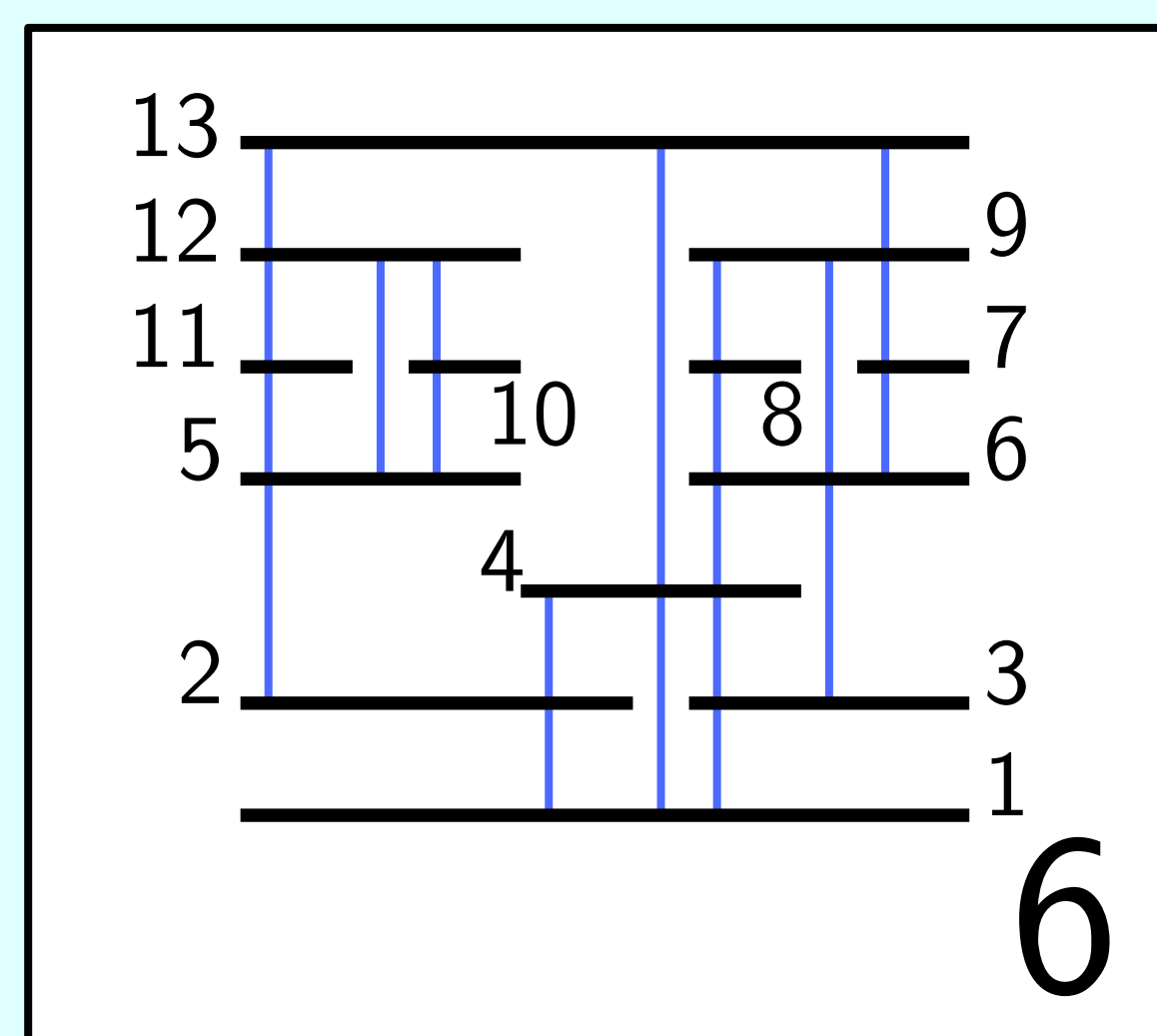
3



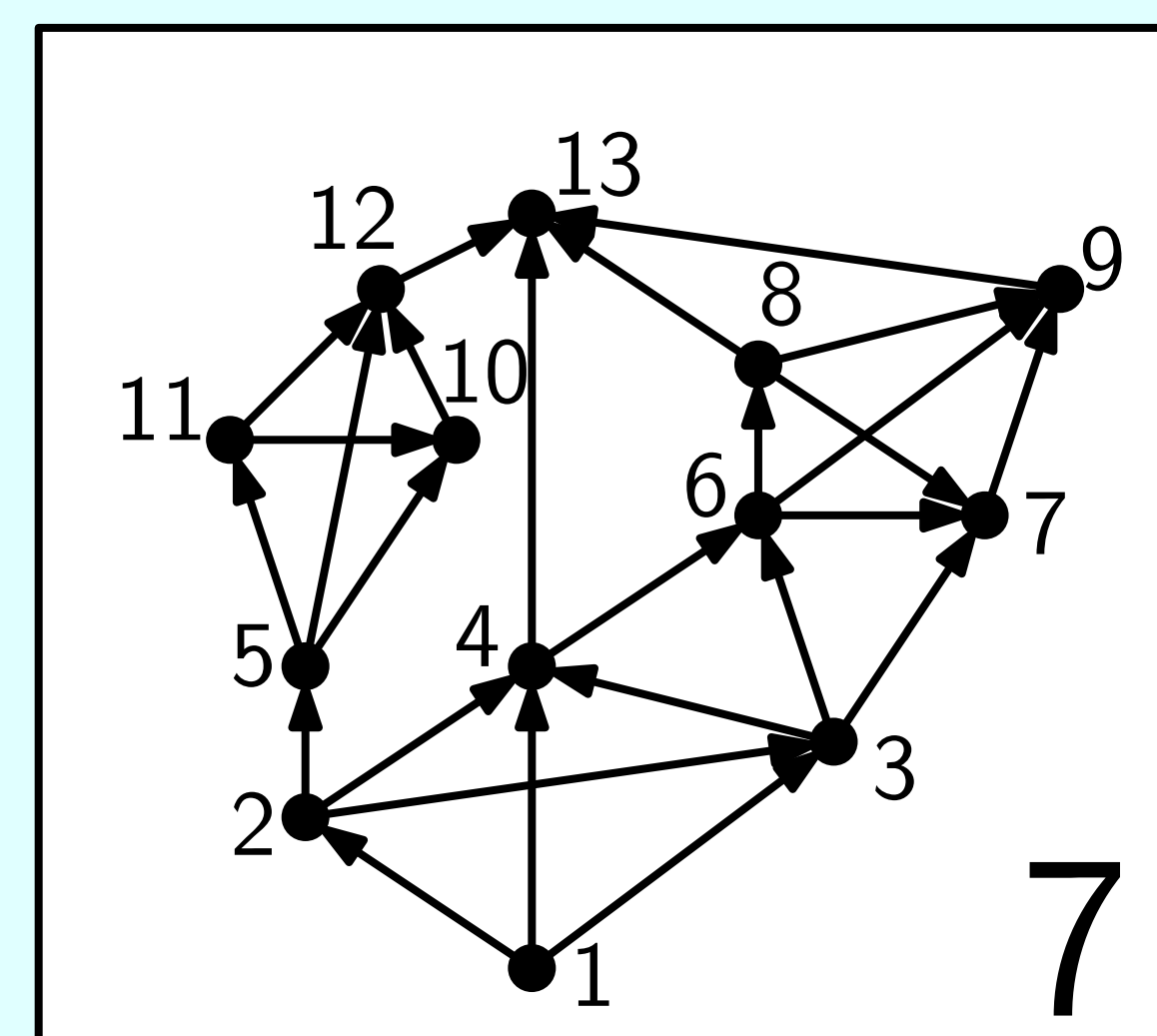
4



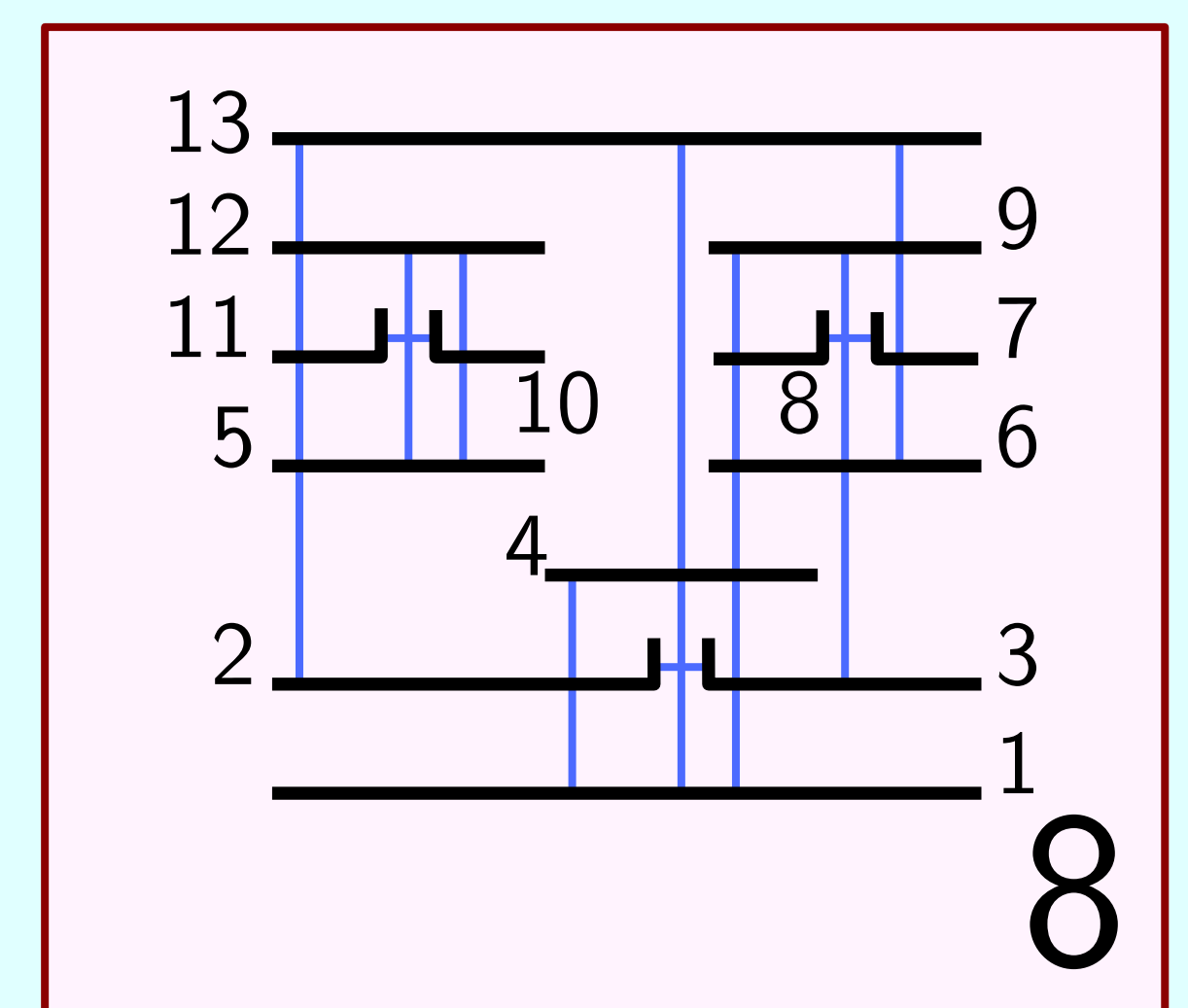
5



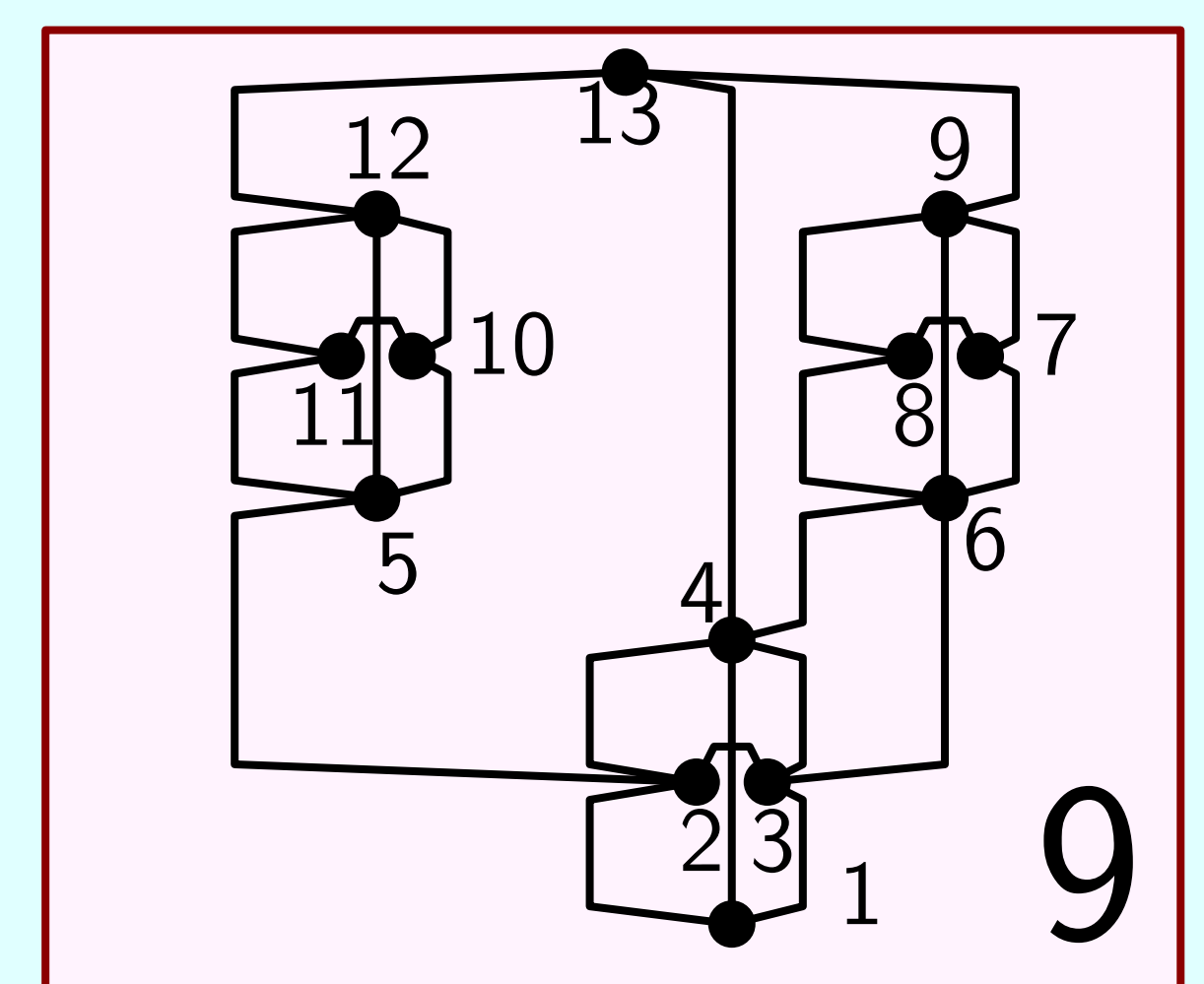
6



7



8



9

## Open Problems:

- Does every 1-planar graph admit an L-visibility drawing, or a visibility drawing where the shape associated with each vertex is a more general +-shape?
- Does every IC-planar graph admit a RAC drawing with at most one bend per edge in polynomial area?

## References

- [1] F. J. Brandenburg. 1-visibility representations of 1-planar graphs. *J. Graph Algorithms Appl.*, 18(3):421–438, 2014.
- [2] F. J. Brandenburg, W. Didimo, W. S. Evans, P. Kindermann, G. Liotta, and F. Montecchiani. Recognizing and drawing IC-planar graphs. In *GD 2015*.
- [3] W. S. Evans, M. Kaufmann, W. Lenhart, T. Mchedlidze, and S. K. Wismath. Bar 1-visibility graphs vs. other nearly planar graphs. *JGAA*, 18(5):721–739, 2014.
- [4] W. S. Evans, G. Liotta, and F. Montecchiani. Simultaneous visibility representations of plane  $st$ -graphs using L-shapes. In *WG 2015*.
- [5] D. Král and L. Stacho. Coloring plane graphs with independent crossings. *J. Graph Theory*, 64(3):184–205, 2010.
- [6] G. Liotta and F. Montecchiani. L-visibility drawings of IC-planar graphs. *arXiv*, 2015. <http://arxiv.org/abs/1507.08879>.
- [7] R. Tamassia and I. G. Tollis. A unified approach to visibility representations of planar graphs. *Discr. & Comput. Geom.*, 1(1):321–341, 1986.
- [8] X. Zhang and G. Liu. The structure of plane graphs with indep. crossings and its appl. to coloring problems. *Central Europ. J. Math.*, 11(2):308–321, 2013.