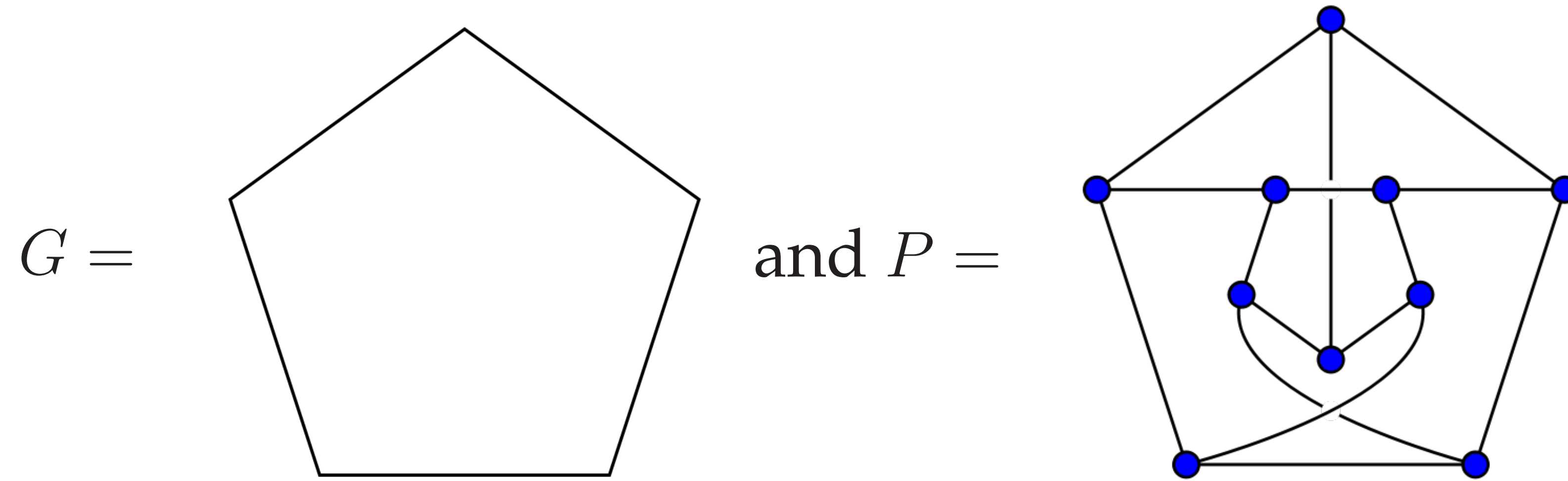


Planar Permutation Graphs

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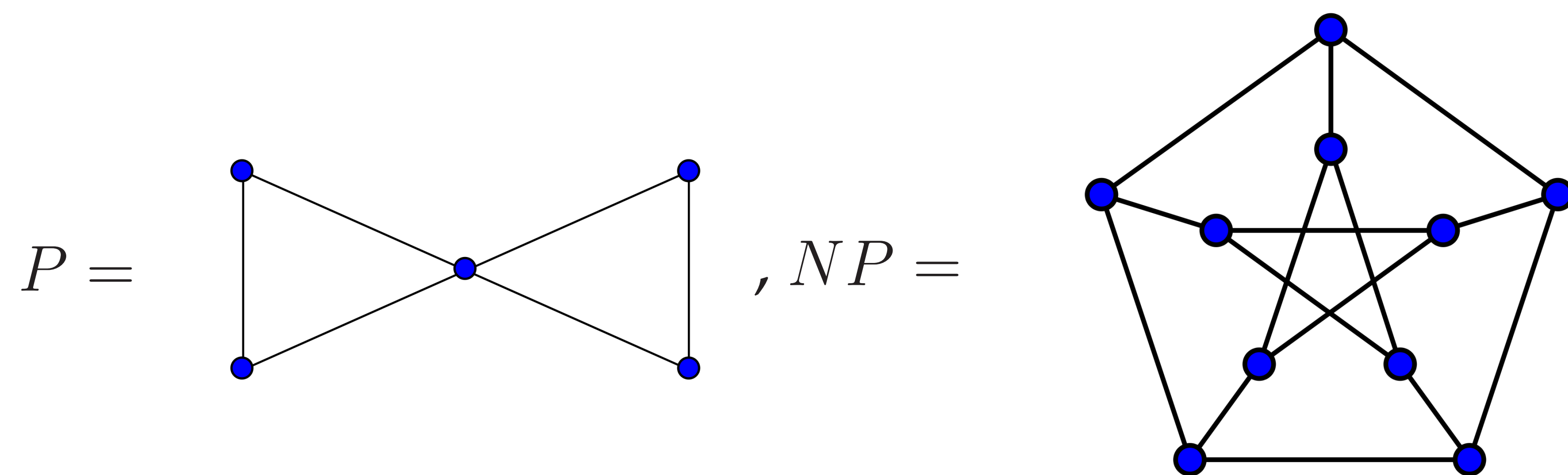
DEFINITIONS

- A permutation graph P is two copies of a given graph G where you link each vertex of the first copy to one vertex of the second.

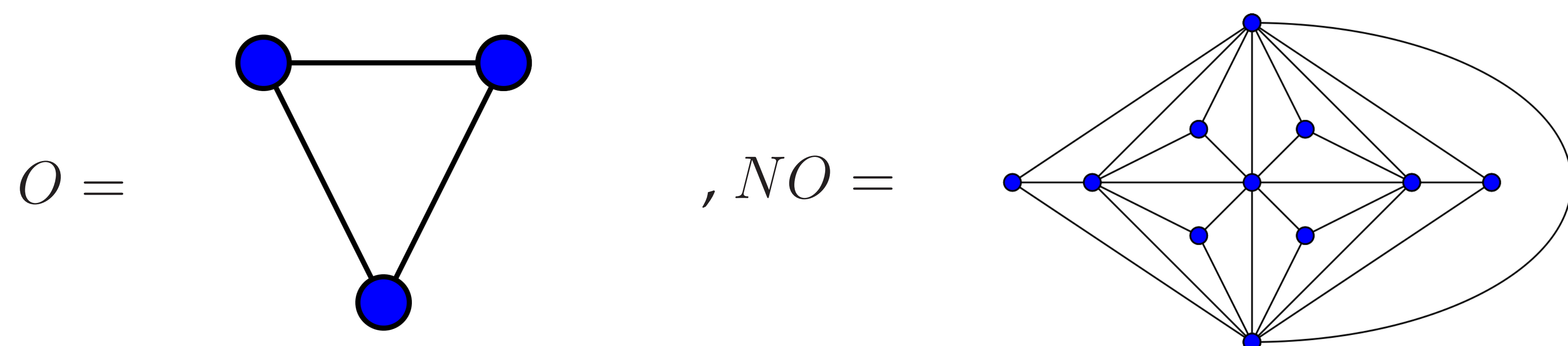


If you number all N vertices in the same way, the edges that link vertices of each copy represent a permutation α of $\{1, \dots, N\}$. We call P an α -permutation graph on G .

- A planar graph is a graph that can be drawn on the plane in such a way that its edges intersect only at their endpoints.

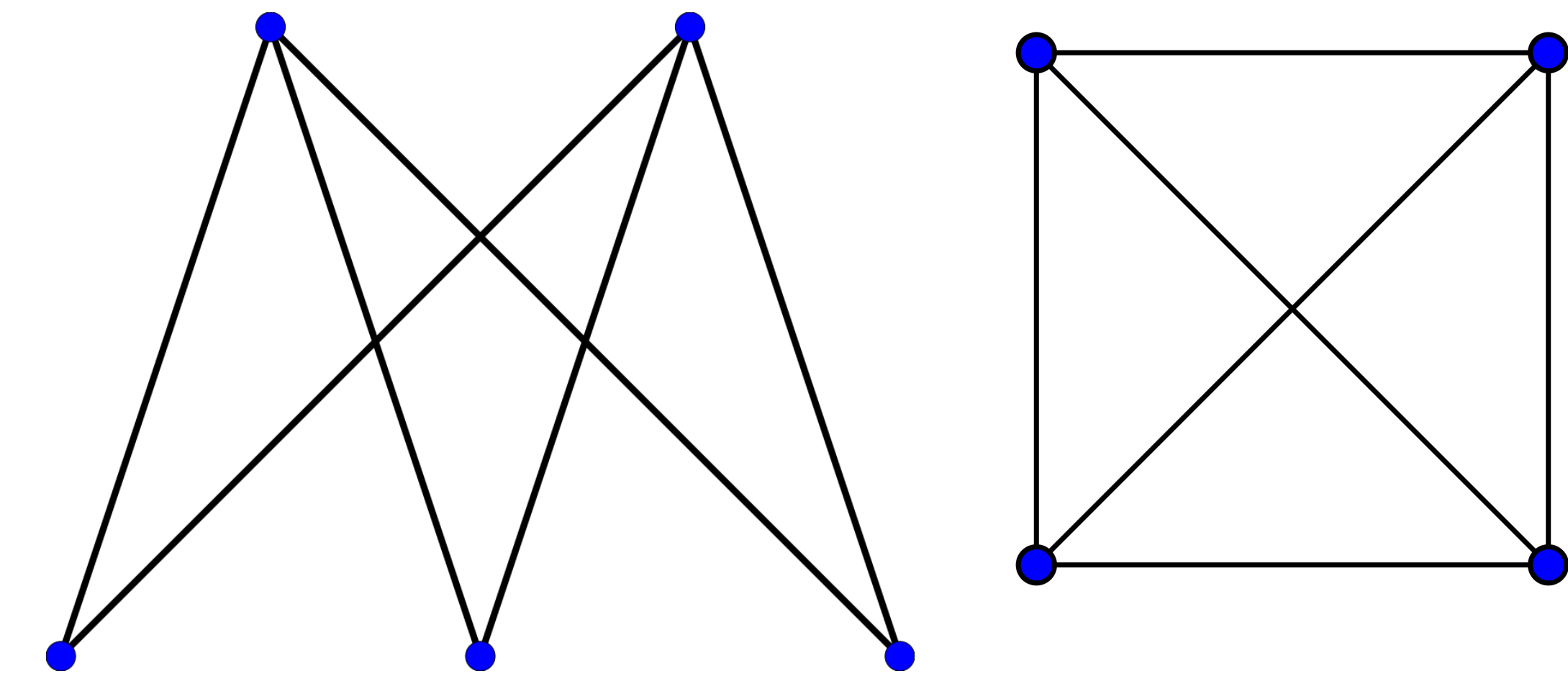


- An outerplanar graph is a planar graph for which all vertices belong to the outer face of the drawing.



RESULTS

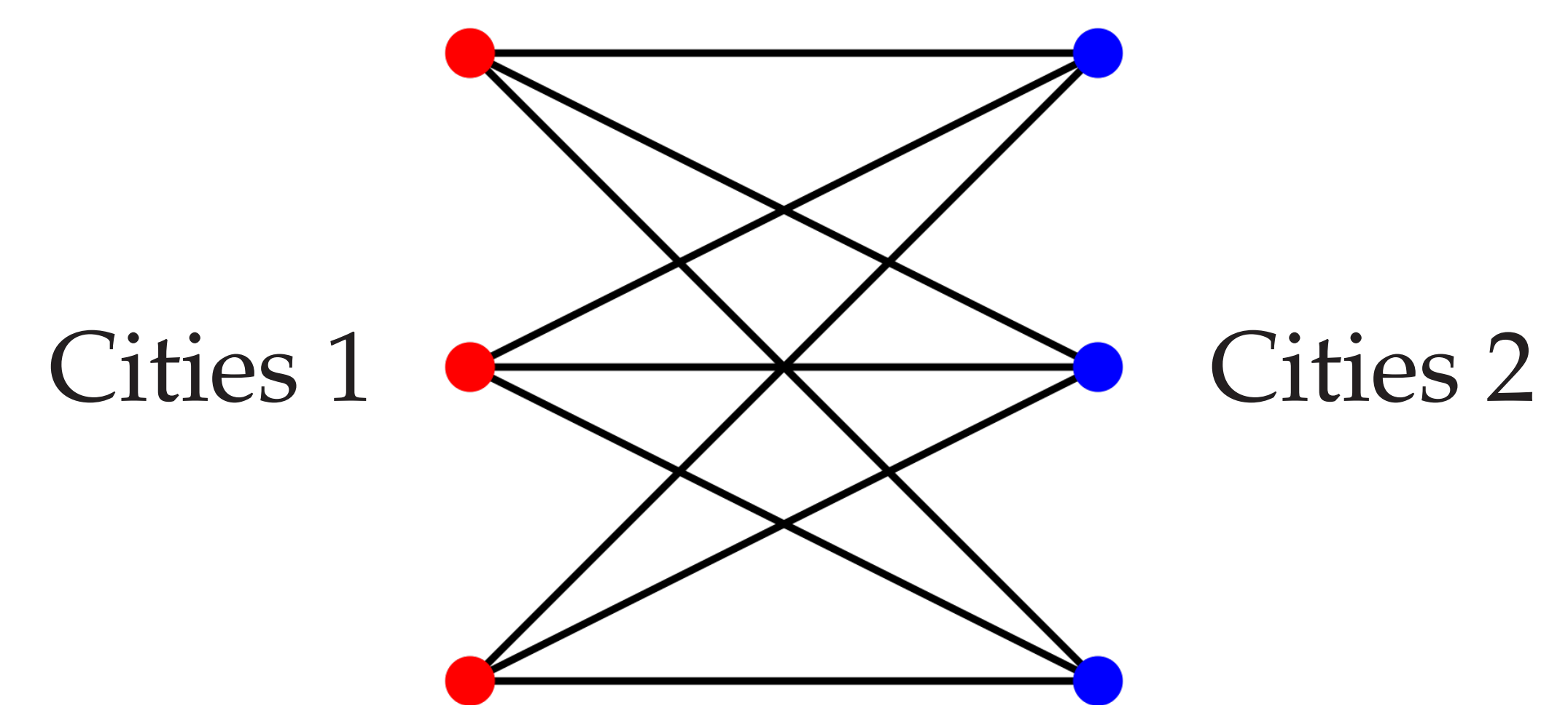
- A graph is outerplanar if and only if it does not have a sub-graph homeomorphic to one of these graphs:



- An α -permutation graph on a nonseparable graph G is planar if and only if G is outerplanar and α keeps the N -gon invariant.

APPLICATIONS

- Suppose we have two collections of cities-airports. We connect two cities-airports if there is a flight between them.



Planar permutation graphs will help us to assign flight altitudes to connecting cities, by preventing flights colliding mid-air.

REFERENCES

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 Planar Permutation Graphs. Annales de l'I.H.P. Probabilités et statistiques, Tome 3 (1967) no. 4, pp. 433-438. http://www.numdam.org/item/AIHPB_1967__3_4_433_0/