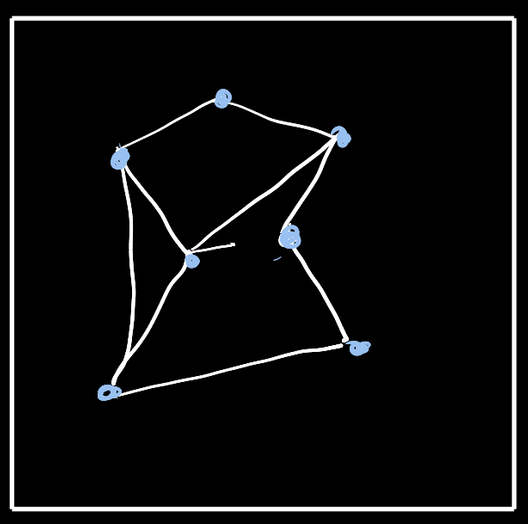
#. Euler $V - E + f = 2$

↳ applicable in graphs

Graph → Planar (→ no intersecting lines) and Connected



Faces also include the outer region.

V → points

E → Edges

#. Spanning Tree and

↓

any Tree inside a graph which touches all the Vertices is called a spanning Tree.

(That is no Cycles) {we weigh Edges such to not visit the visited again}

Dual graphs

↓

Connecting regions (here regions with common Edge are considered connected.

Thus, we have named it as Dual Graph.

Outer region is treated, somewhere in Infinity.

Dual Graph is so much connected to original graph.

Dual graph always have thier spanning Tree too.

↓

In any tree $[E + 1 = V]$ (Edges not part of spanning tree of original graph)

As one starts from a point and then keeps adding Edges, so +1.

(No. of Randolph's Edges) + 1 = V

(No. of Mortimer's Edges) + 1 = F

⇓

$\{E + 2 = V + F\}$ → Euler formula derivation from graphs.