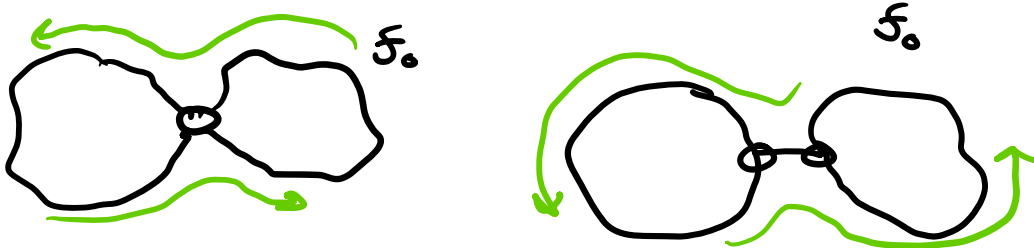


- ① Consider traversing the outer face
- We know all faces form a closed walk
 - This walk is not a path if any edge or vertex is traversed twice

How can that happen on a face?



Vertex: this requires a cut vertex **X**

Edge: requires a cut edge (and cut verts) **X**

G is 2-connected (and 2-edge-connected)

→ so we have a face that is a closed path containing all $v \in V(G)$

⇒ This is a spanning cycle \square
(Hamiltonian cycle - more later)

- ② We've shown before, any closed walk/trail/path on a bigraph requires an even length

requires an even length

→ Any spanning cycle on a bigraph must be even

→ $K_{2,3}$ has an odd vertex cardinality

⇒ $K_{2,3}$ cannot have a spanning cycle and therefore cannot be outerplanar per (1) □

