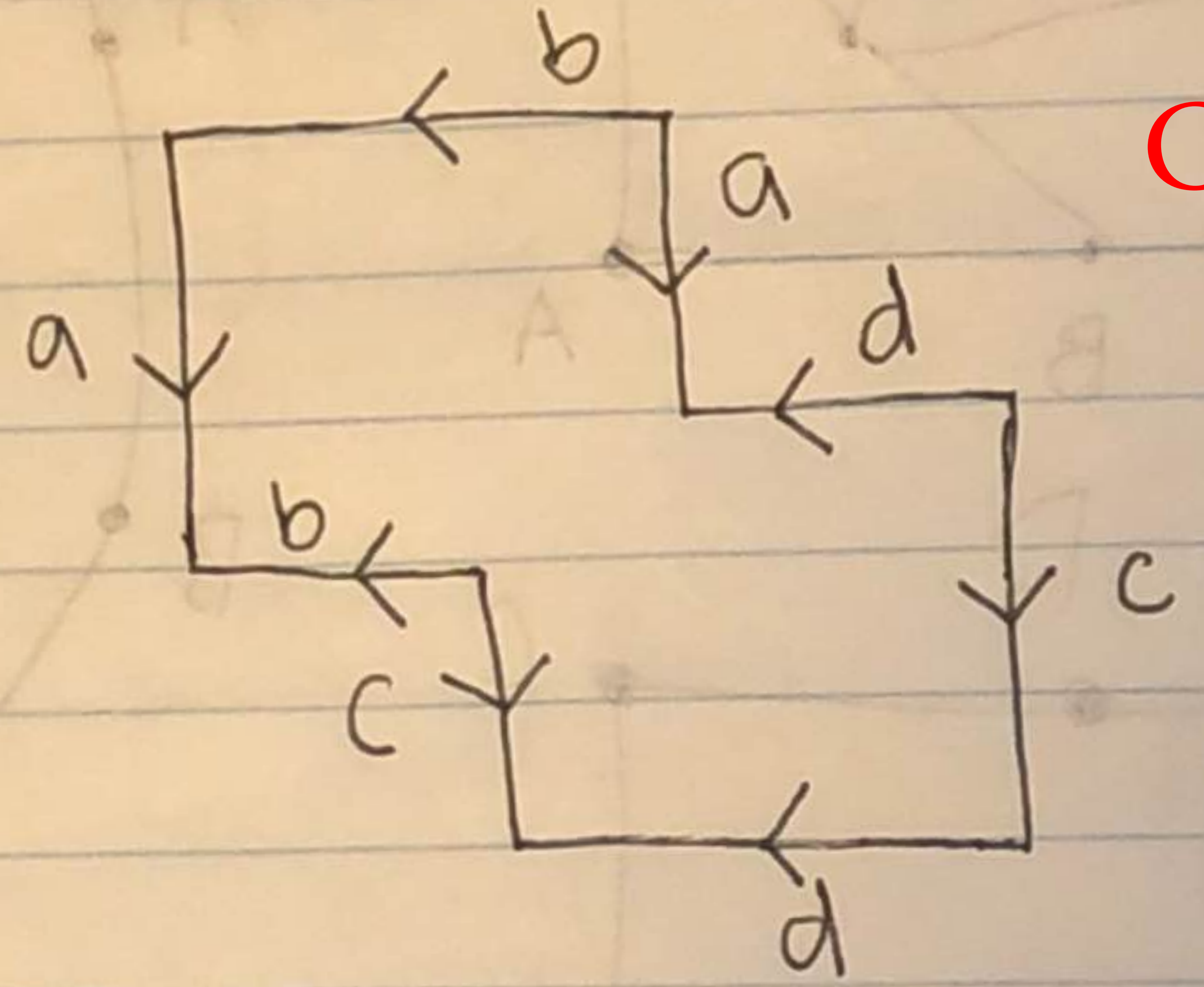
Overall: R

C

Exercise 1:

(a) From class, we found that we could represent a double-holed torus by the octagon:



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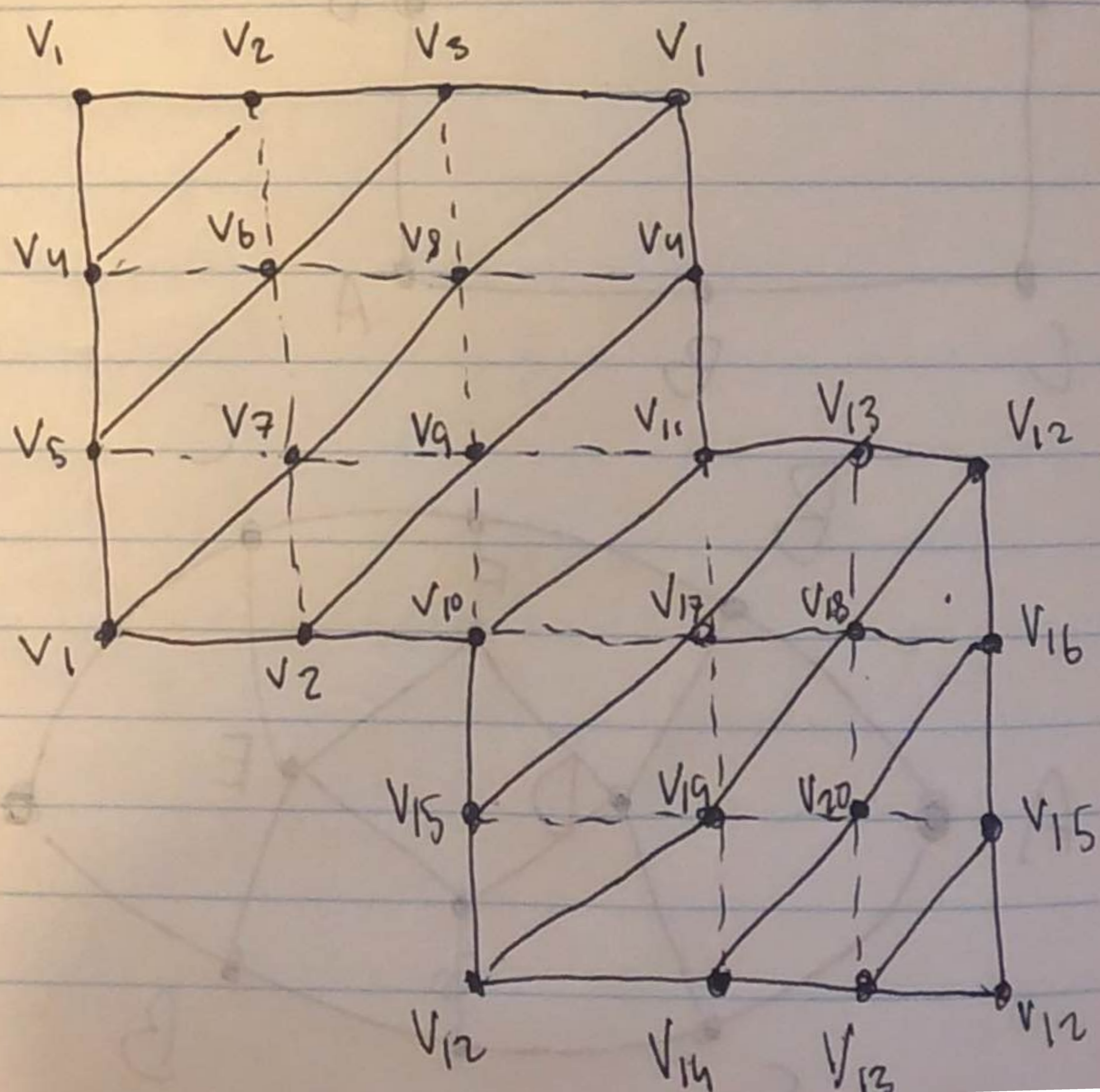

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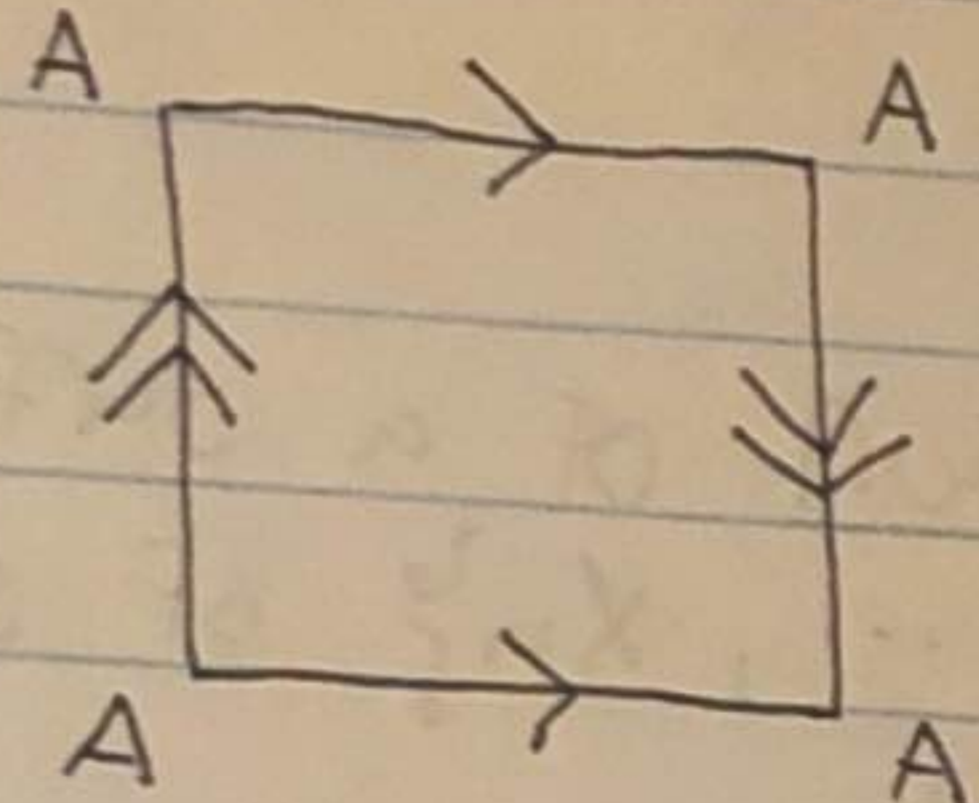
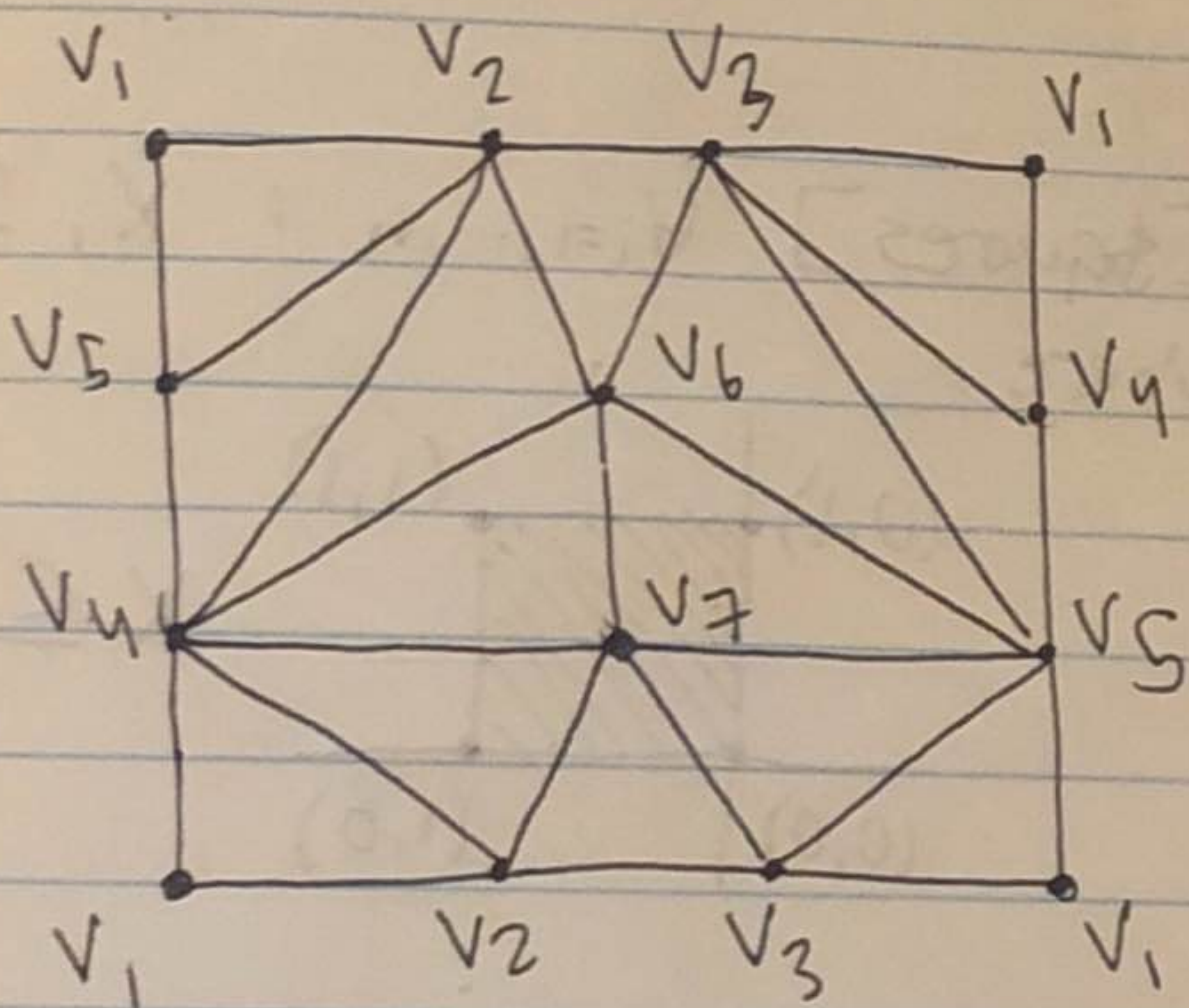
b) $\mathbb{K}^2$:





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I put both prior representations of $\mathbb{T}^{2\#2}$ and $\mathbb{K}^2$ to show that the triangles cover each respectively. For the other axioms, observe that each triangle is unique, and has only <u>one vertex</u>, <u>one edge</u>, or <u>nothing</u> in common. Thus the axioms are indeed satisfied.

C

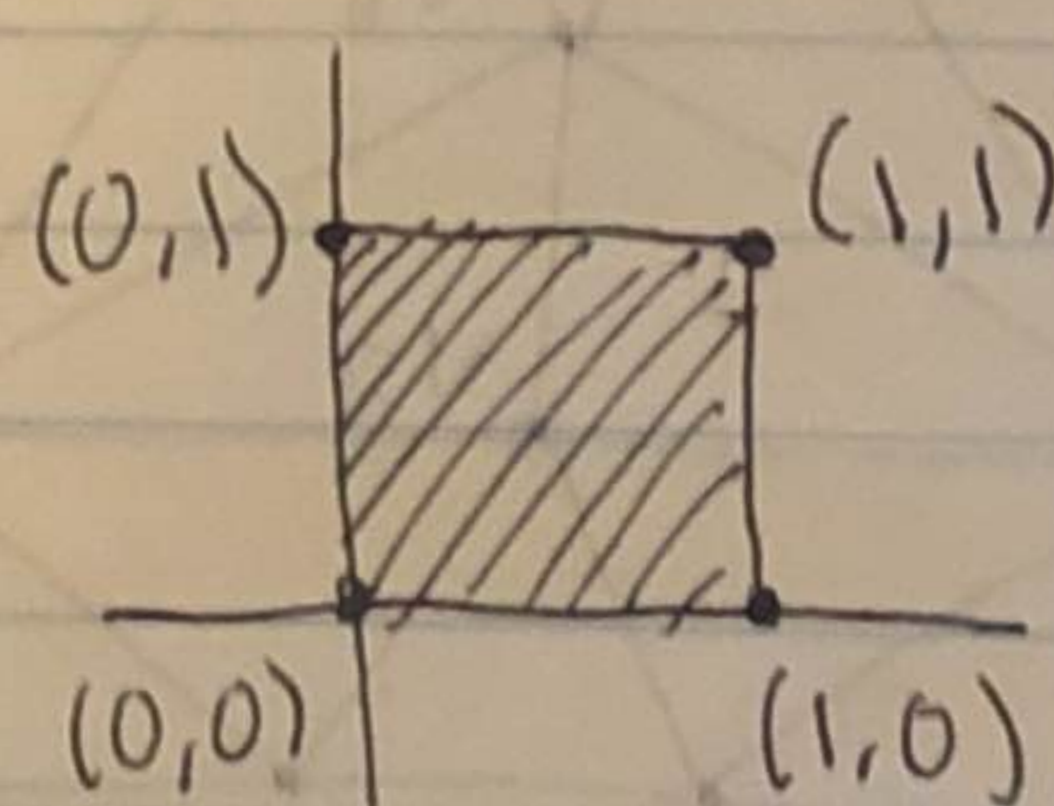
Exercise 2

(a) A squarification of a surface S is a set $\{X_1, \dots, X_n\}$ of subsets of S such that

(a) [coverage] $S = \bigcup_{i=1}^{n} X_i$

(b) [squares] $\forall i=1,\dots,n : X_i \cong X$
where

C

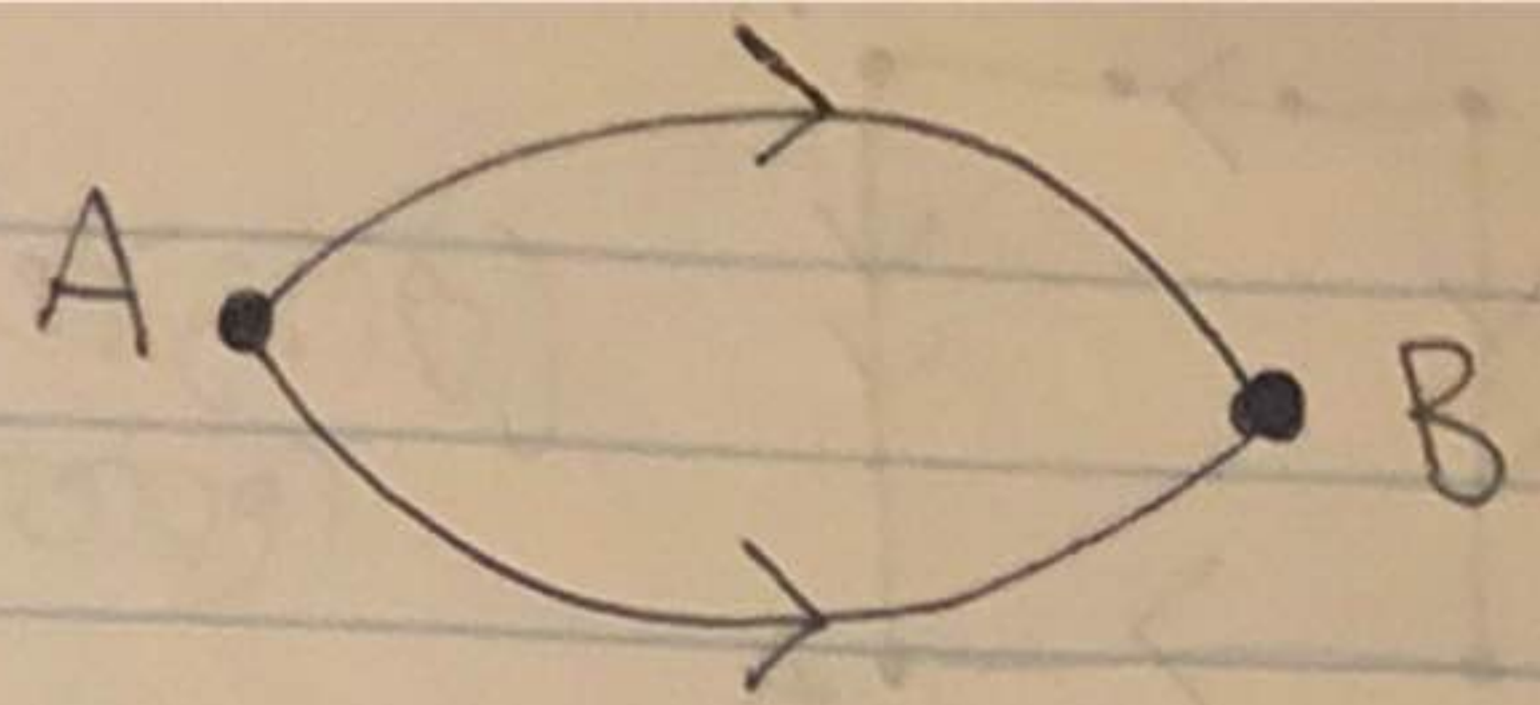


$X \subseteq \mathbb{R}^2$

(c) [intersections] $\forall i \neq j$:

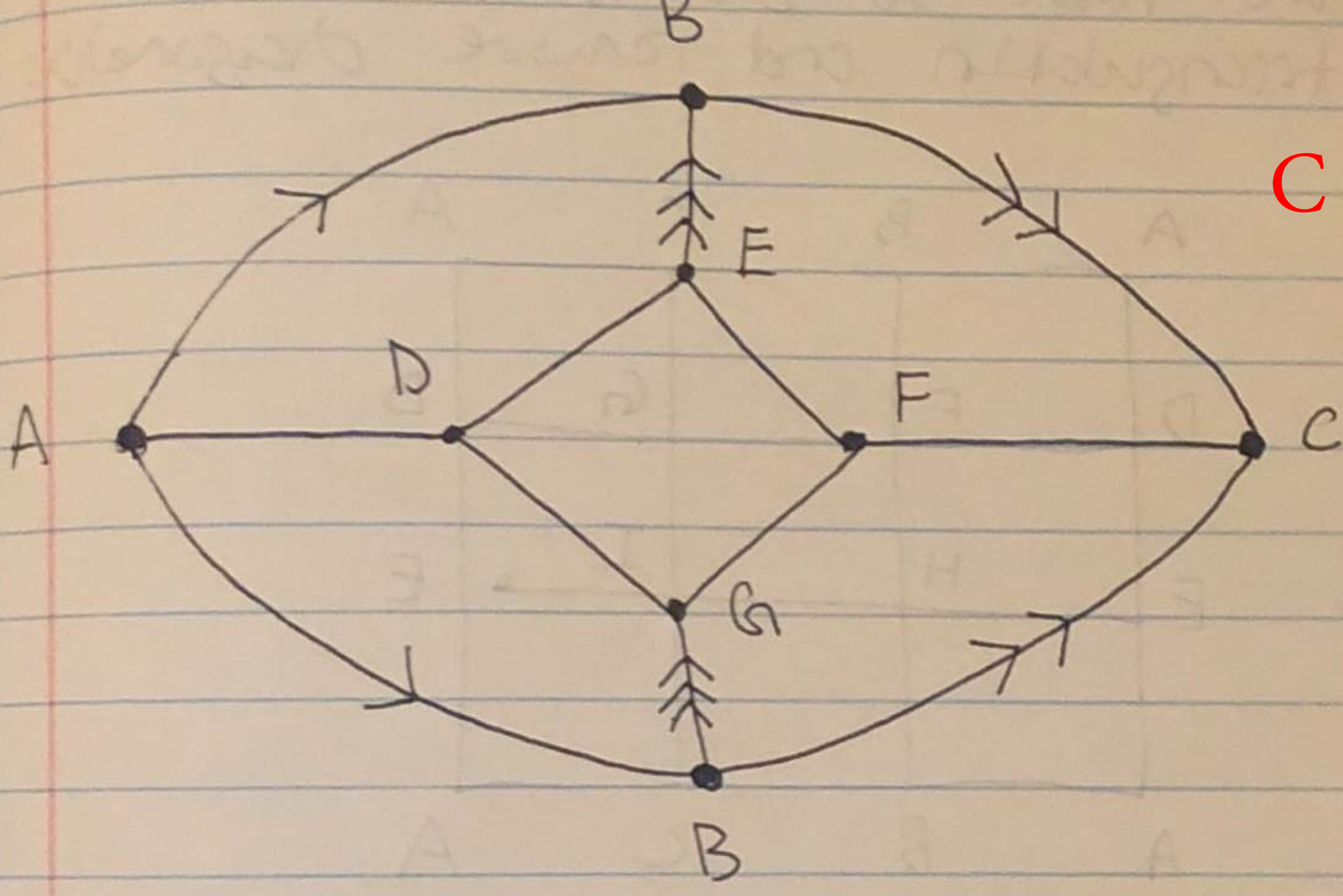
$$X_i \cap X_j = \begin{cases} \emptyset & \text{or} \\ \text{single vertex} & \text{or} \\ \text{single edge} & \text{or} \end{cases}$$

(b) S^2 :

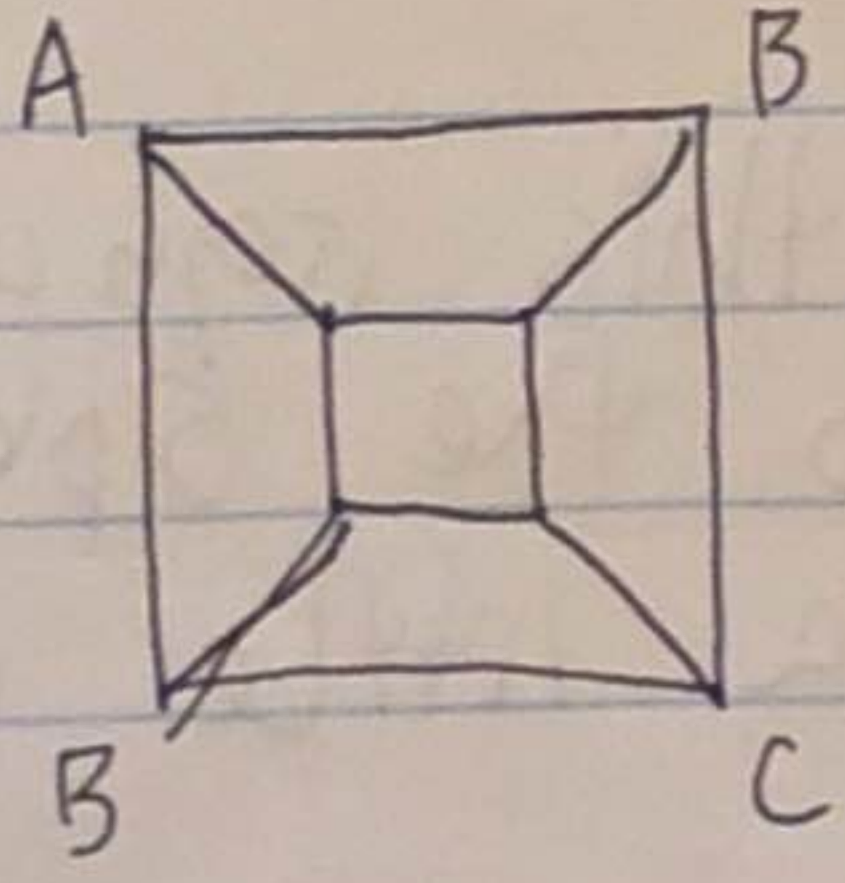


(original representation)

I will expand this representation and add squares by adding more vertices:

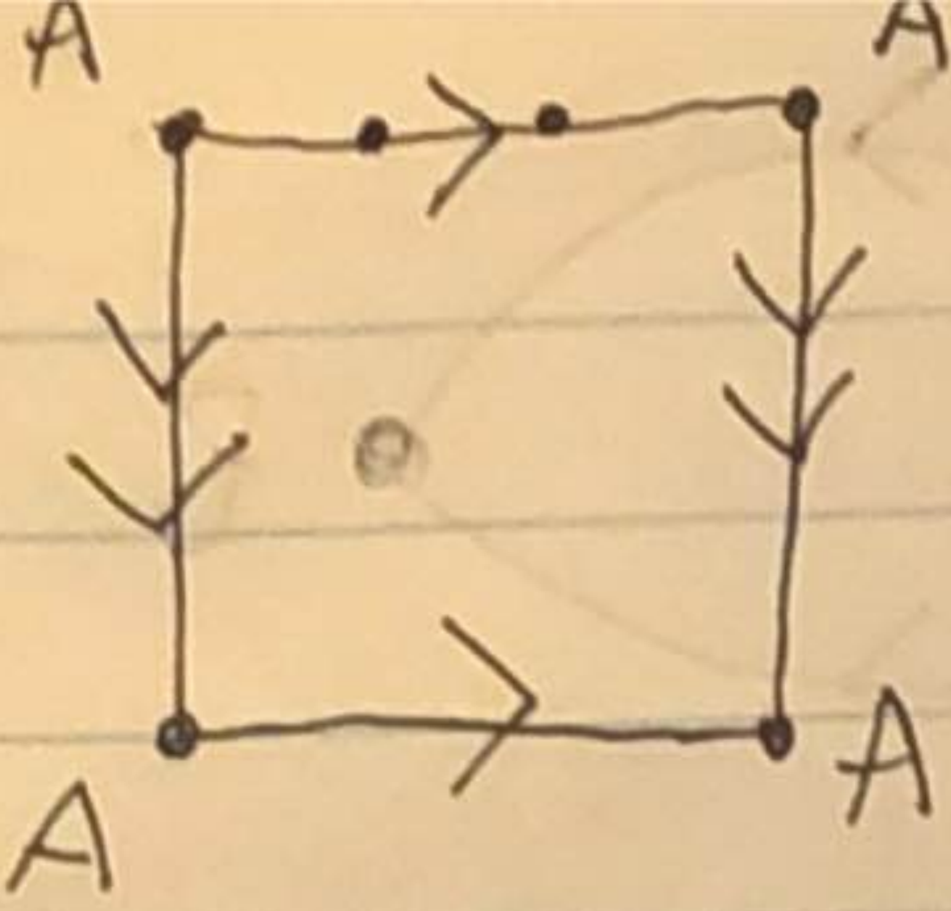


(And I just realized I can do this with the square representation, too :)



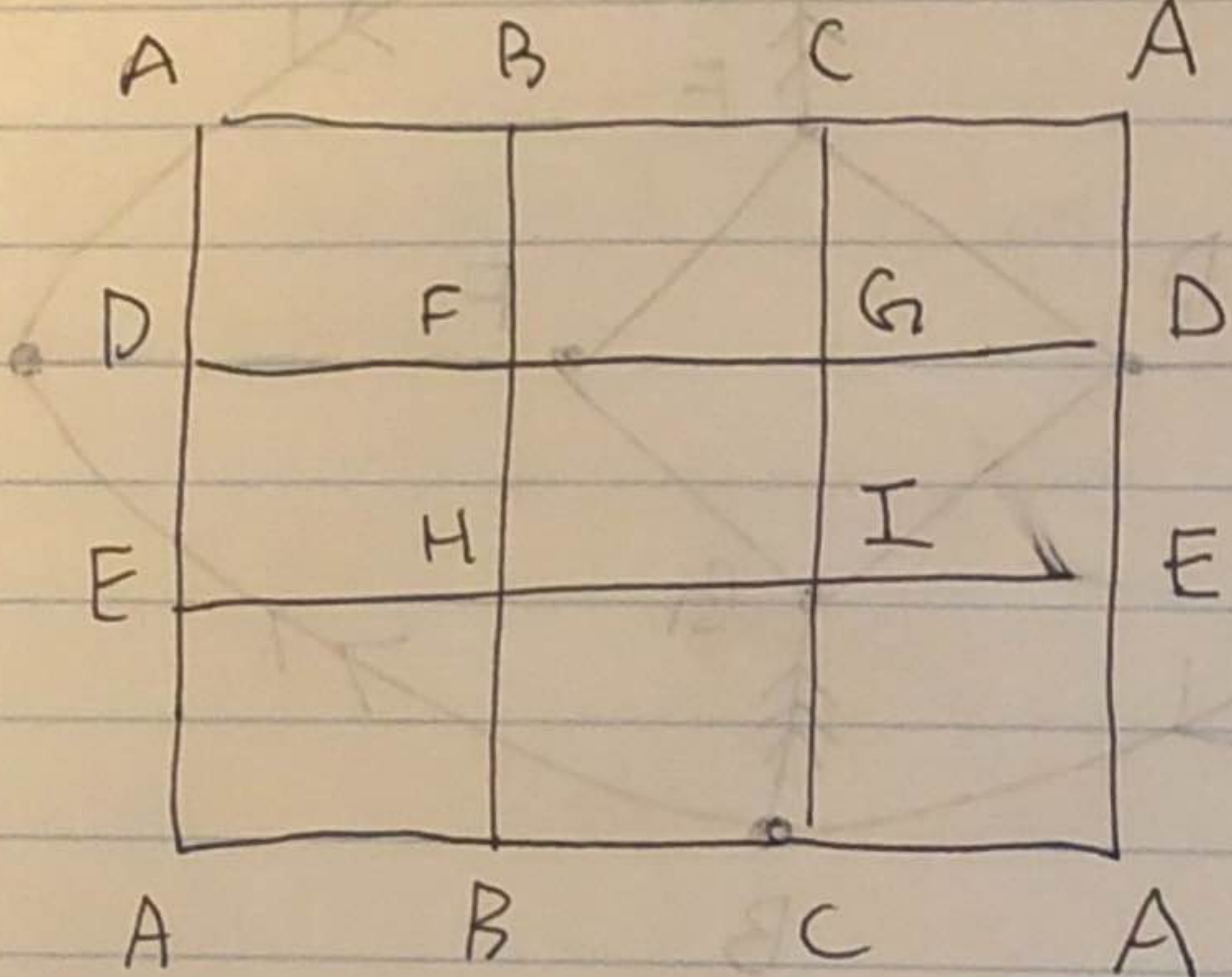
$\boxed{R}$

$\mathbb{T}^2$:



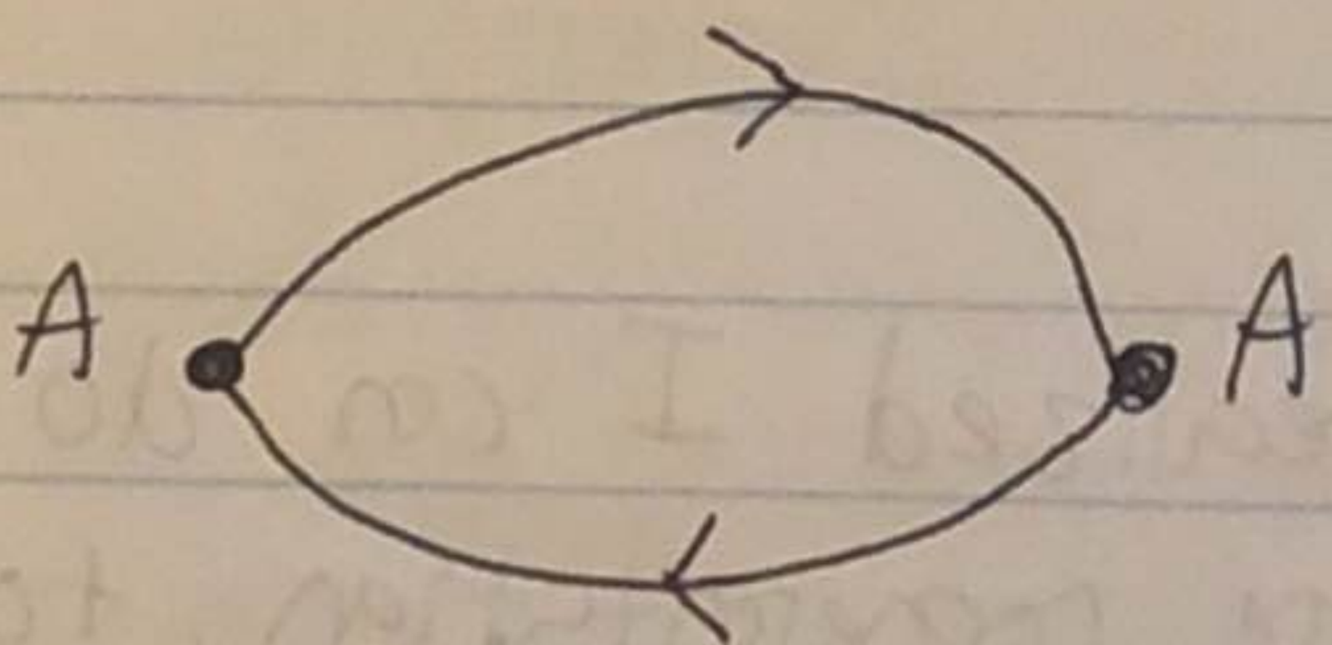
(original representation)

This squarification is easier, all we have to do is take its triangulation and remove diagonals:



C

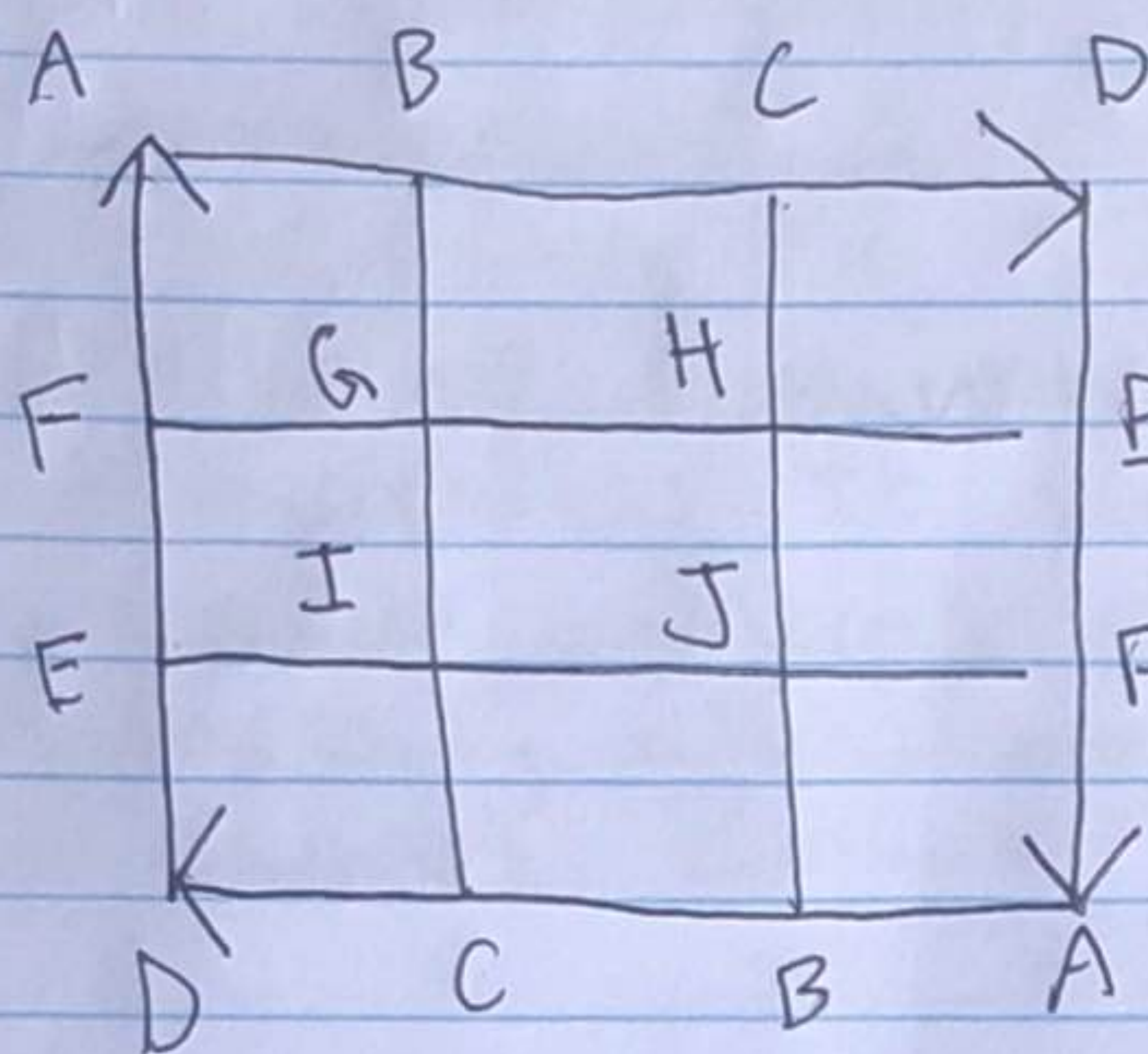
$\mathbb{P}^2$:



(original representation)

I actually found this squarification while trying to do the sphere, since they were a little similar:

Squarification of $\mathbb{P}^2$:



C
(please ignore my math work below)

$\tilde{d}(x,y) \leq d(x,y) \leq \sqrt{n}\,\tilde{d}(x,y)$

$d(x,y) < \epsilon$

$\sqrt{n}\,\tilde{d}(x,y) \leq \sqrt{n}\,d(x,y) < \sqrt{n}\,\epsilon$