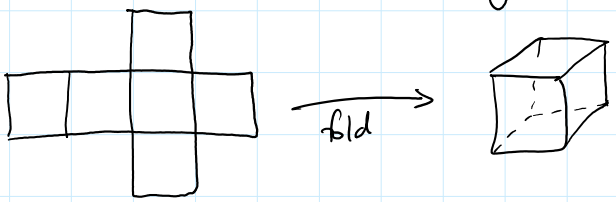
POLYHEDRAL NETS: connected planar layout of polygonal faces, that can be folded and glued to produce a polyhedron

EXAMPLE:

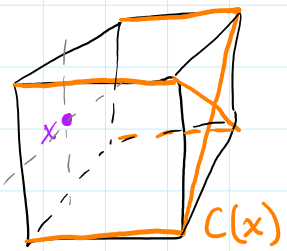


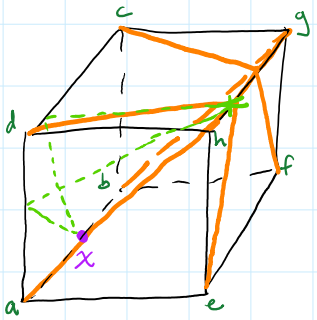
Fact: Some nonconvex polyhedra have no net.

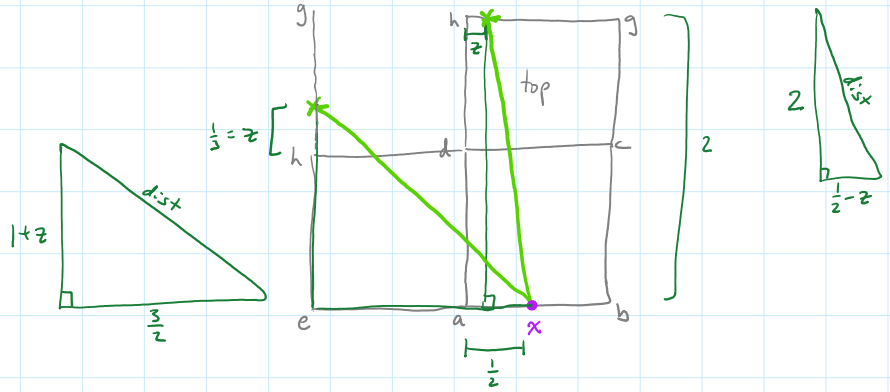
Open Problem: Does every convex polyhedron have a net?

CUT LOCUS: For a polyhedron P, the cut locus $C(x)$ is the closure of the set of all points $y \in P$ to which there is more than one shortest path to x.

EXAMPLE:







$$\text{dist} = \sqrt{(1+z)^2 + \left(\tfrac{3}{2}\right)^2} = \sqrt{2^2 + \left(\tfrac{1}{2} - z\right)^2}$$

$$1 + 2z + z^2 + \tfrac{9}{4} = 4 + \tfrac{1}{4} - z + z^2$$

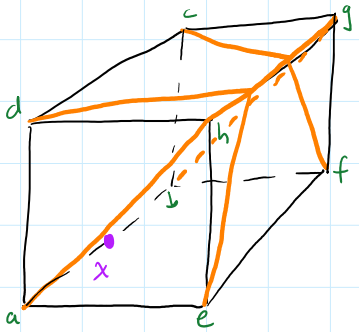
$$2z + \tfrac{13}{4} = \tfrac{17}{4} - z$$

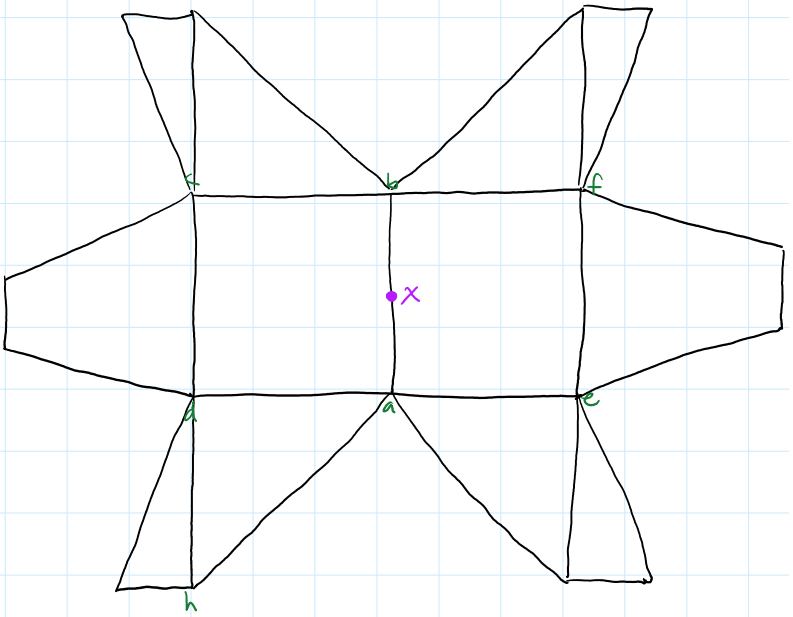
$$3z = 1 \quad \text{or} \quad z = \tfrac{1}{3}$$

SOURCE UNFOLDING

For a convex polyhedron P, the source unfolding is what you get if you cut along the cut locus and flatten.

EXAMPLE:





CUT LOCUS ALGORITHM

1987: first algorithm $O(n^2 \log n)$

1997: improved to $O(n^2)$

2008: improved to $O(n \log n)$