BASIC STRUCTURES

POINTS!

NOT IN GENERAL POSITION
MONOTONE

ORTHOGONAL

STAR-SHAPED

etc
JORDAN CURVE theorem

- any closed curve \(C\) separates the plane in 2 components: 1 bounded and 1 unbounded

AND

- any path linking 2 points in different components must cross \(C\).
The J.C. thm. has a relatively short proof for polygons. It is much worse for curves, especially non-piecewise differentiable (e.g. Koch snowflake).

Any 2 pts in same component are linked by a path that does not cross $\subset$. Path can continuously shrink to a point...

In 3D, take a closed sphere, or other shape w/ same genus. Any loop inside can shrink to a point. But something strange can happen outside (horned sphere).
Back to testing: point in polygon?

Easy: by Jordan
Back to testing: point in polygon

Plumb Line Algorithm

- Take ray to $\infty$
- Iff odd # intersections: In time?
WINDING NUMBER ALGORITHM

> start w/ arbitrary ray from \( \bullet \) to a point on poly.
WINDING NUMBER ALGORITHM

> start w/ arbitrary ray from to a point on poly.
> rotate as you walk on poly.
WINDING NUMBER ALGORITHM

> start w/ arbitrary ray from \( \bullet \) to a point on poly.
> rotate as you walk on poly.
> count # full turns
> result: \( \begin{cases} 
1 & : \text{IN} \\
0 & : \text{OUT} 
\end{cases} \)