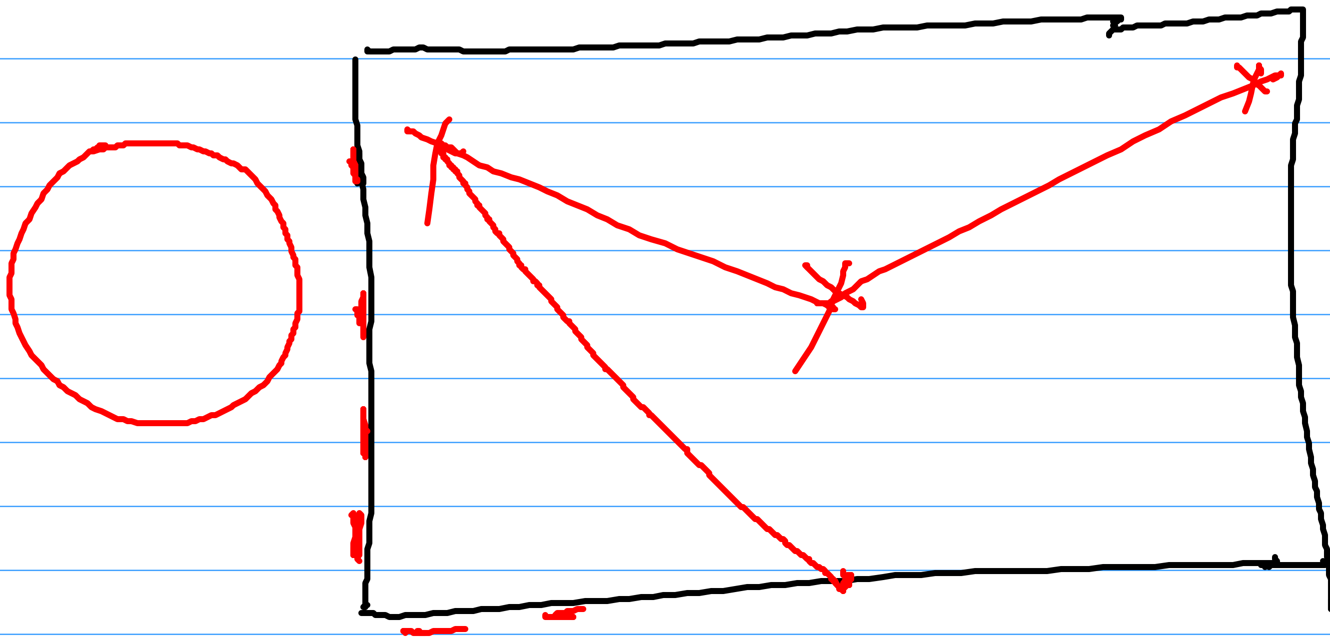
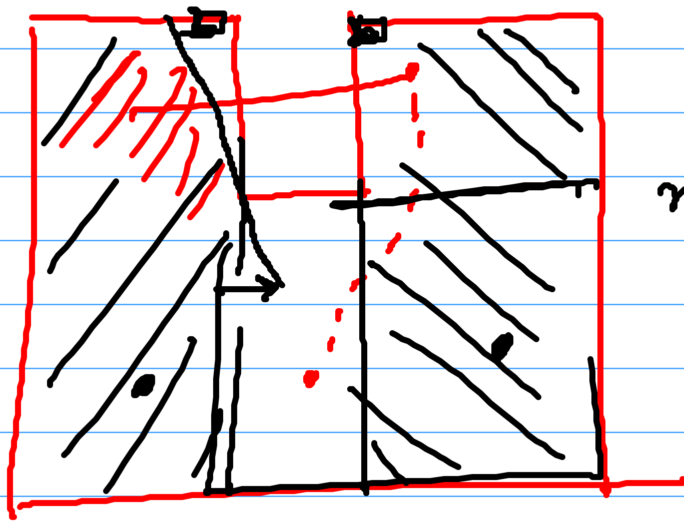
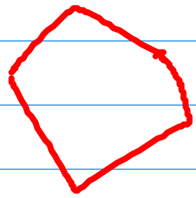
Computational Geometry CSL 852
Lecture 2

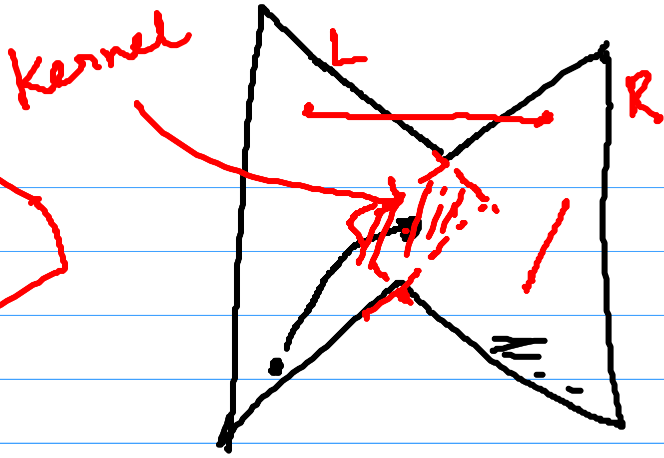


Every point in the boundary (interior) should be visible to at least one guard

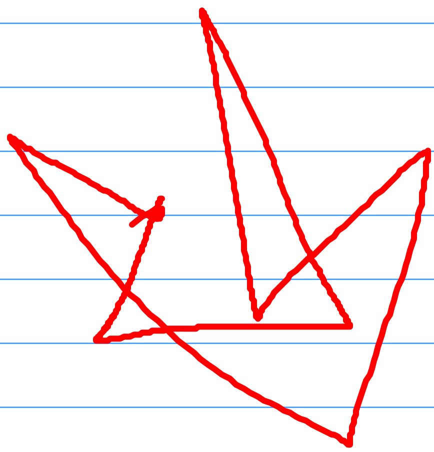


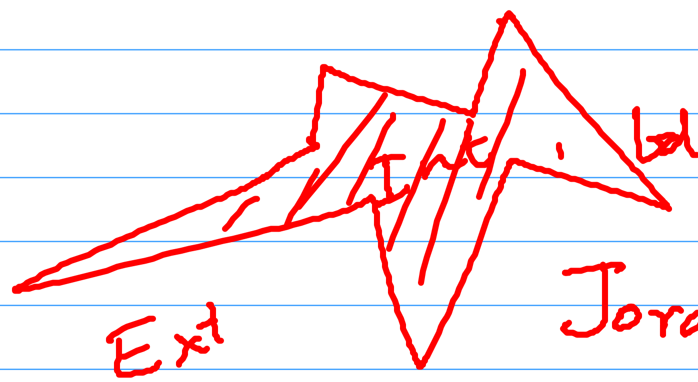
2 guards are necessary and sufficient





Simple polygon: It is a closed area on the plane that has a boundary comprised of straight line segments (that do not intersect)



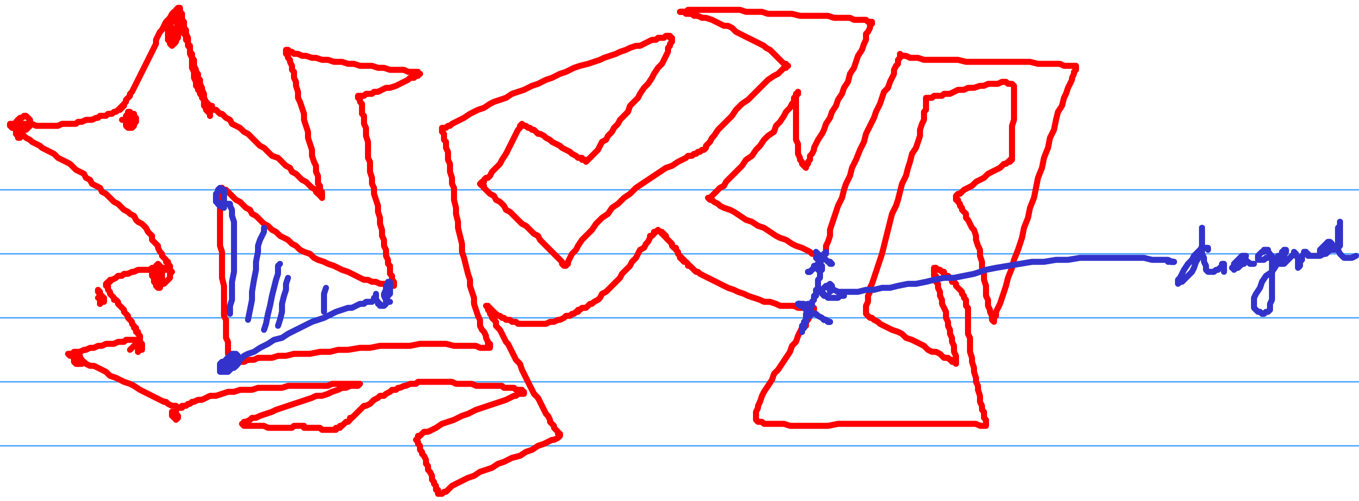


Jordan curve

- Star shaped polygon: From at least one point, everything is visible
- convex polygon : Take any two points in the interior.

$\forall\, p_1, p_2$ { If the segment joining them doesn't intersect the bd, then it is convex

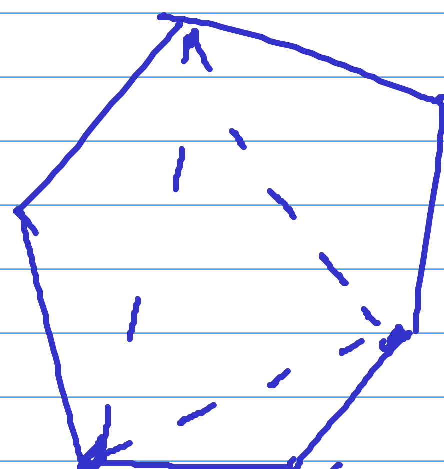
<u>Goal</u> : Given any arbitrary simple polygon, find (algorithmically) the minimum number of guards



For a simple polygon with n vertices, what can we say about

1. Minimum number of guards required (in the worst case)

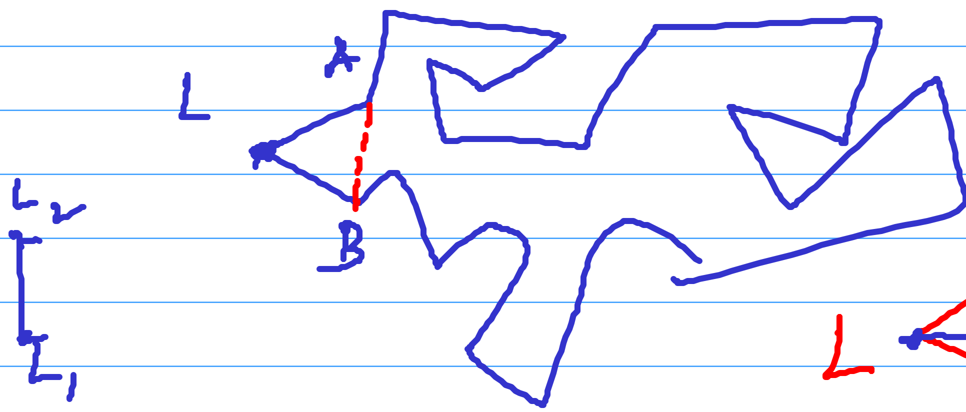
2. Maximum # guards required (in the worst case) $\left\lfloor \frac{n}{3} \right\rfloor$

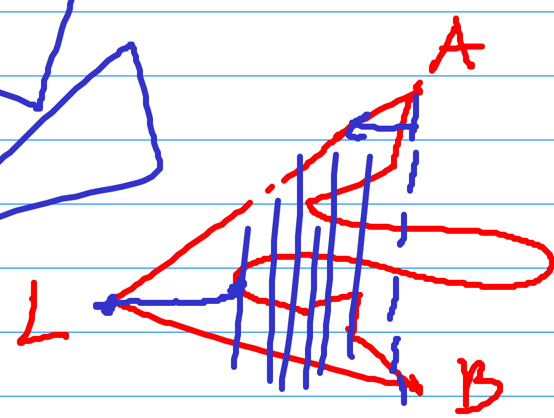


<u>Obs 1</u>: If we can Δate a simple polygon then n guards (posted at vertices) suffice.

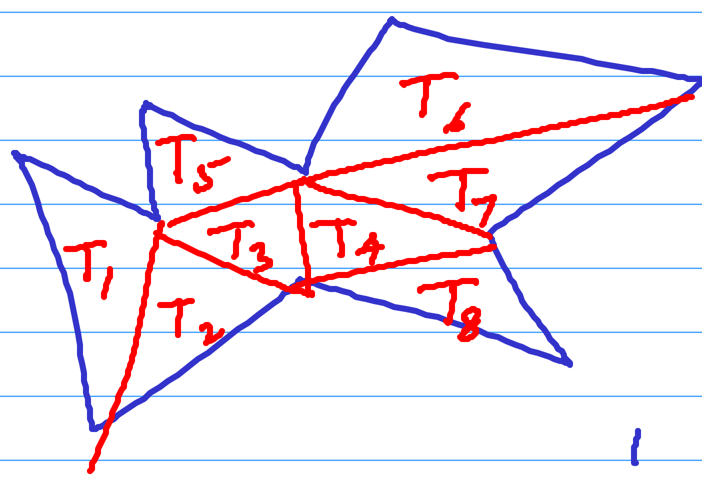
Claim We can always find a diagonal for a simple polygon (size ≥ 4)

Consider the left most point of the polygon (which is vertex)





Colouring the vertices of the Δs of a given Δtion of the simple polygon in a way such that no two endpoints of a Δ have the same colour :



Claim : It can be done using 3 colours

$\Rightarrow$ Some colour is used no more than $\lfloor \frac{n}{3} \rfloor$

Can we show that there are simple polygons where $\lfloor \frac{n}{3} \rfloor$ guards are necessary (for any n)

Art-Gallery theorem : Chvatal