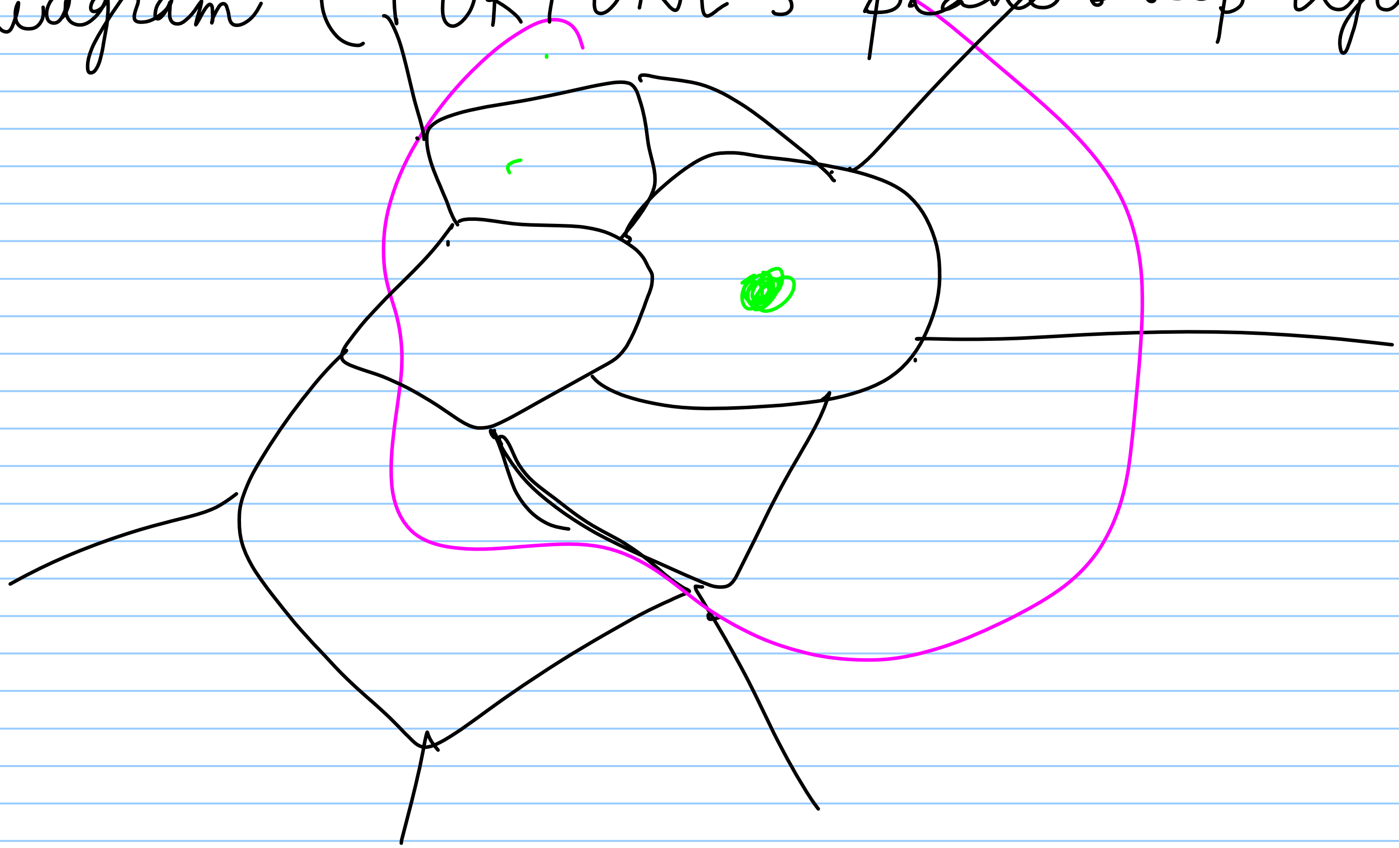
Note Title 05-06-2019

Voronoi diagram (FORTUNE'S plane sweep algorithm)



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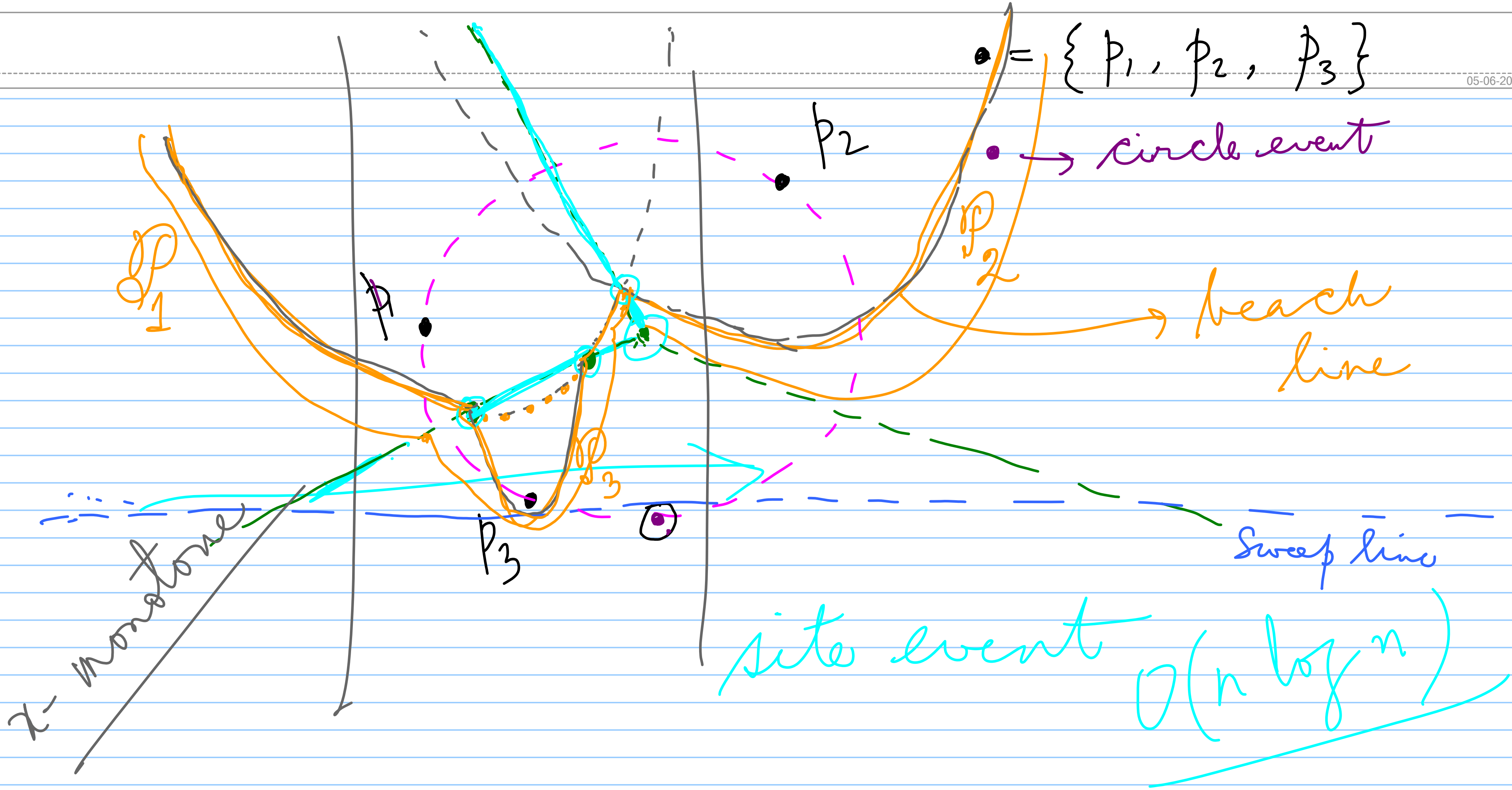

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Farthest Point Voronoi Diagram

$$p_i \longrightarrow \{ q \mid \; - \; - \; - \; - \}$$

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$(x,y) \longmapsto (x, y, x^2+y^2)$ $\qquad$ $\mathcal{L}: z = x^2+y^2$.

Lemma: Let $p, q, r, s \in \mathbb{R}^2$ and let p_0, q_0, r_0, s_0 be their respective projections on $\mathcal{L}$. s lies within the circumcircle of $p, q, r \iff s_0$ lies on the lower side of the plane passing through p_0, q_0, r_0.

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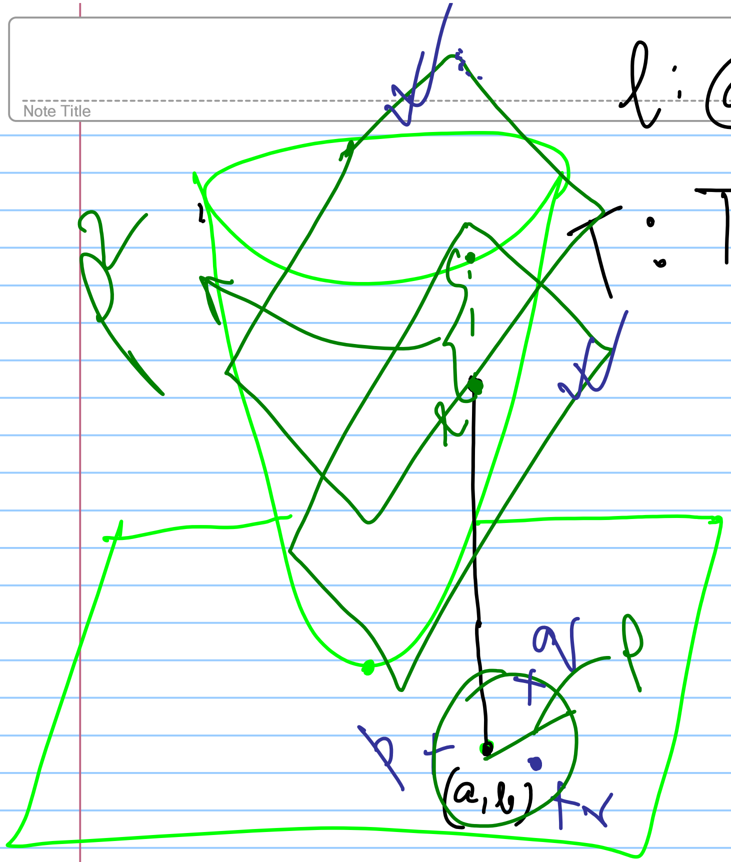
$l : (a,b) \mapsto (a, b, a^2+b^2)$ α : paraboloid $z = x^2+y^2$.



T : Tangent plane at (a, b, a^2+b^2) on α.

$$\left.\frac{dz}{dx}\right|_{x=a} = 2a \qquad \left.\frac{dz}{dy}\right|_{y=b} = 2b.$$

$$T : z = 2ax + 2by + K$$

Solve for K: T passes through l: $K = -(a^2+b^2)$

$$T : z = 2ax + 2by - (a^2+b^2).$$

Shift the tangent plane parallel to itself by a +ve amount ρ^2 to get a new plane T':

$$T' : Z = 2ax + 2by - (a^2+b^2) + \rho^2$$

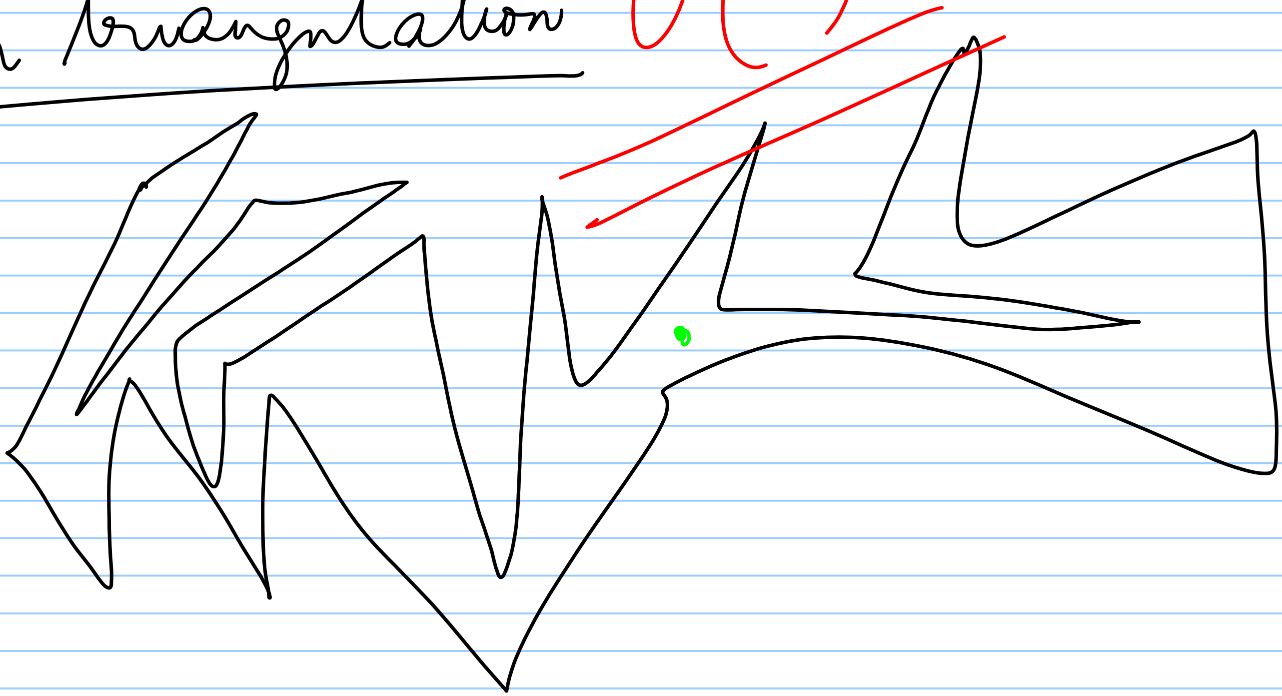
How does T' intersect with α; eliminate Z

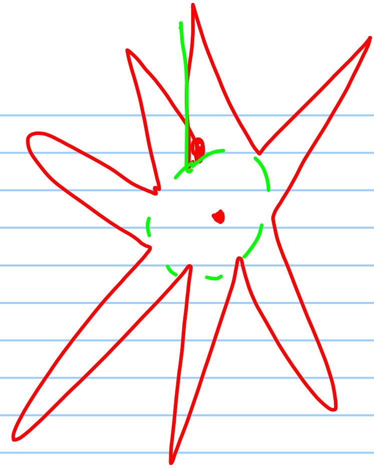
$$x^2 + y^2 = 2ax + 2by - (a^2+b^2) + \rho^2$$

$$\therefore \boxed{(x-a)^2 + (y-b)^2 = \rho^2} \rightarrow$$

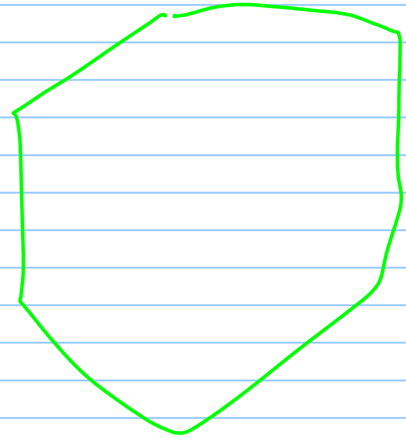
equation of a circle of radius ρ in the original plane.

Polygon triangulation $O(n)$





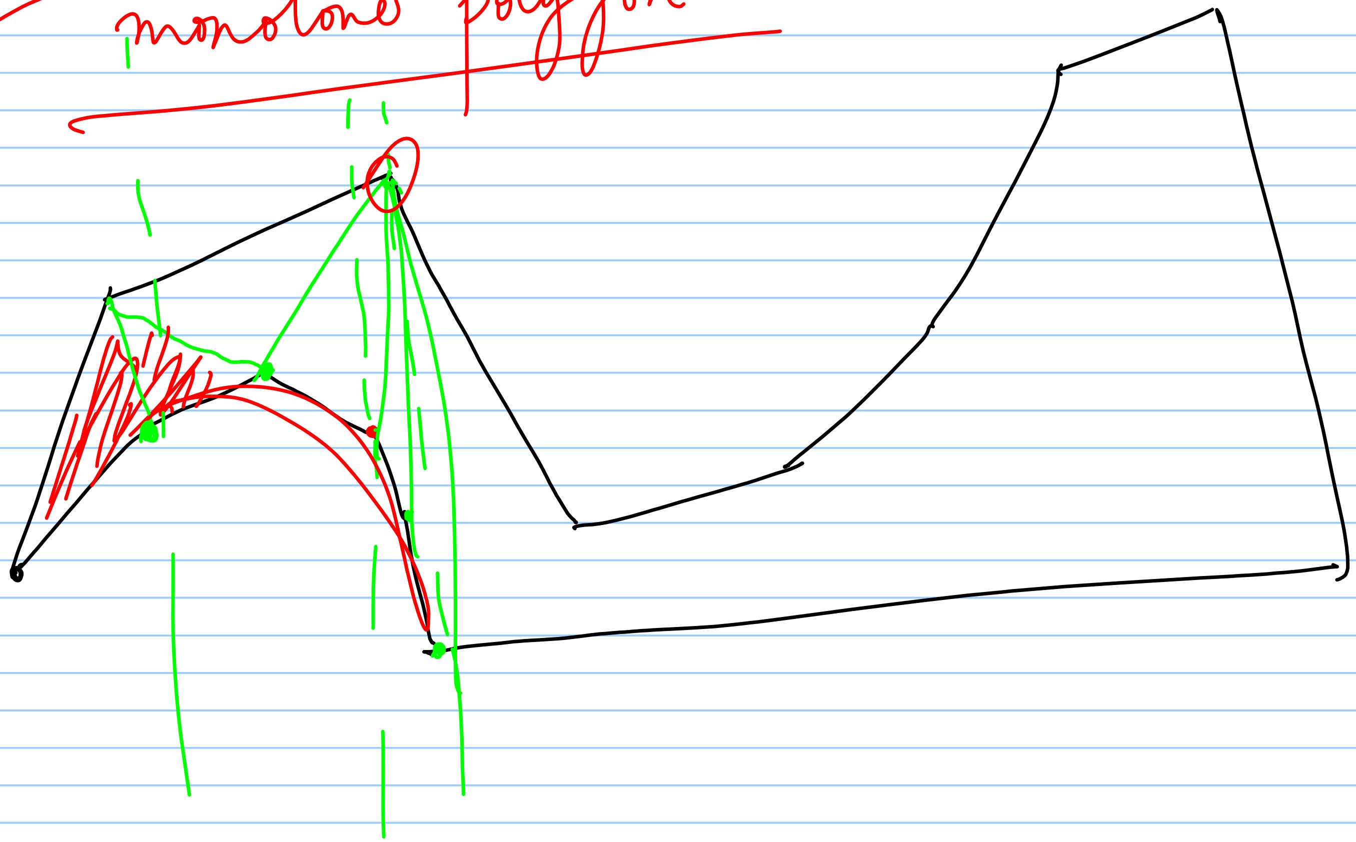
Q:

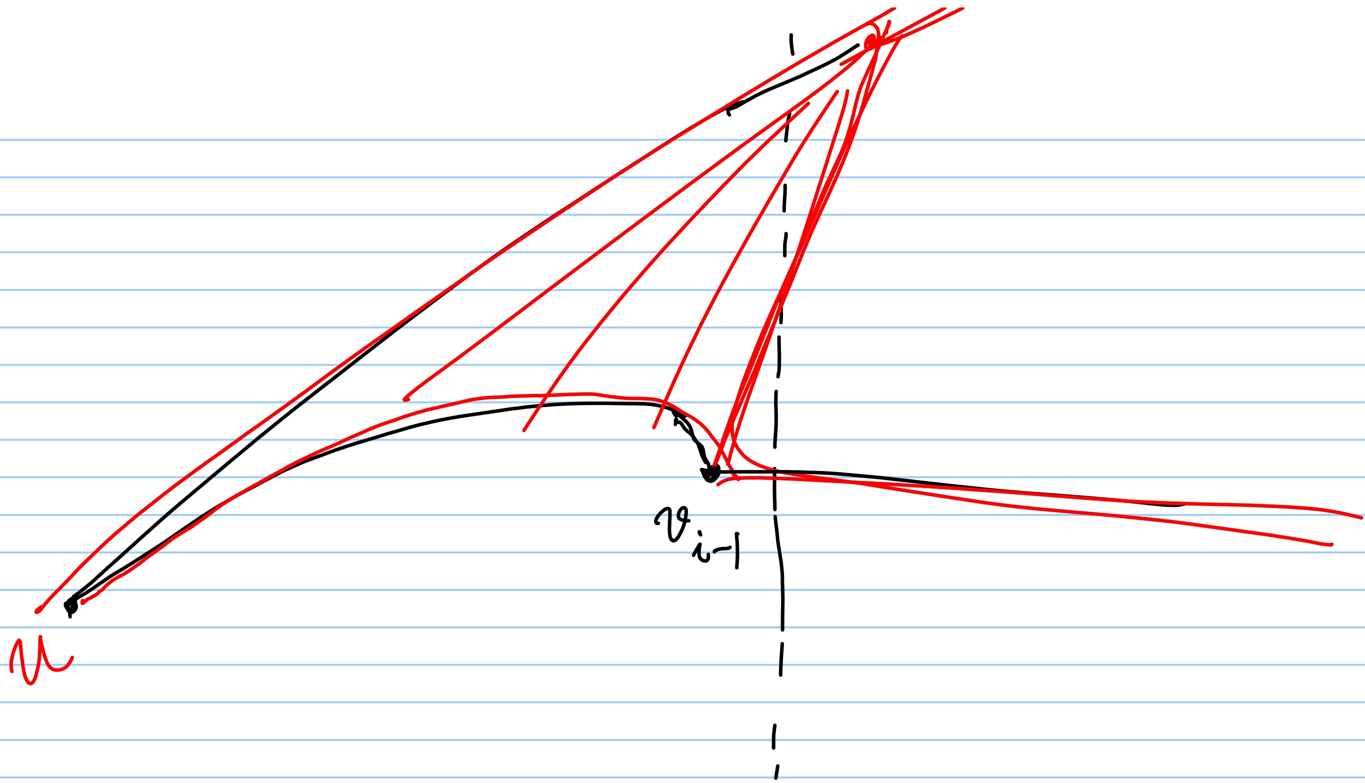


$(n-3)$ non-crossing diagonals to break $(n-2)$ triangles.

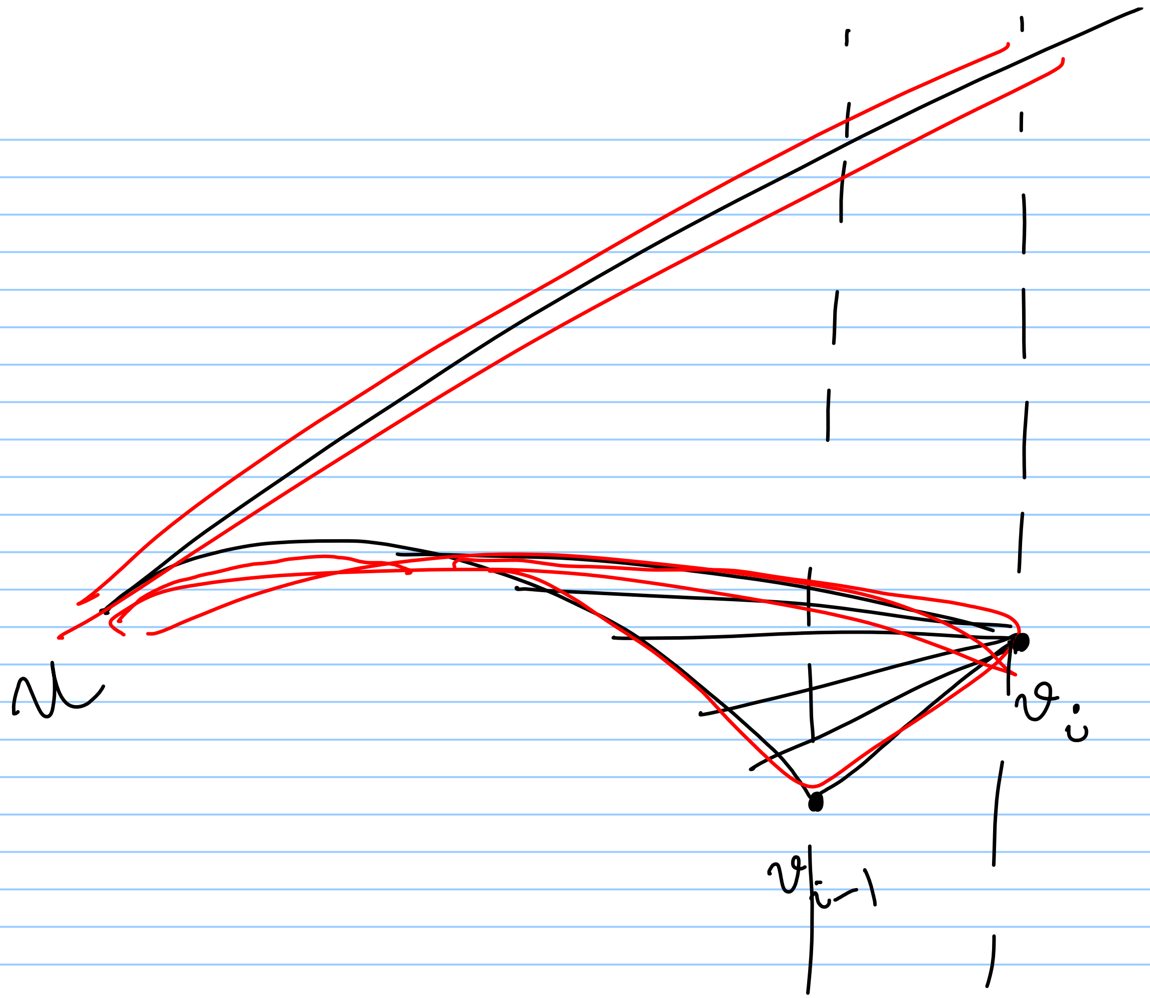
$O(n \log n)$

monotone polygon

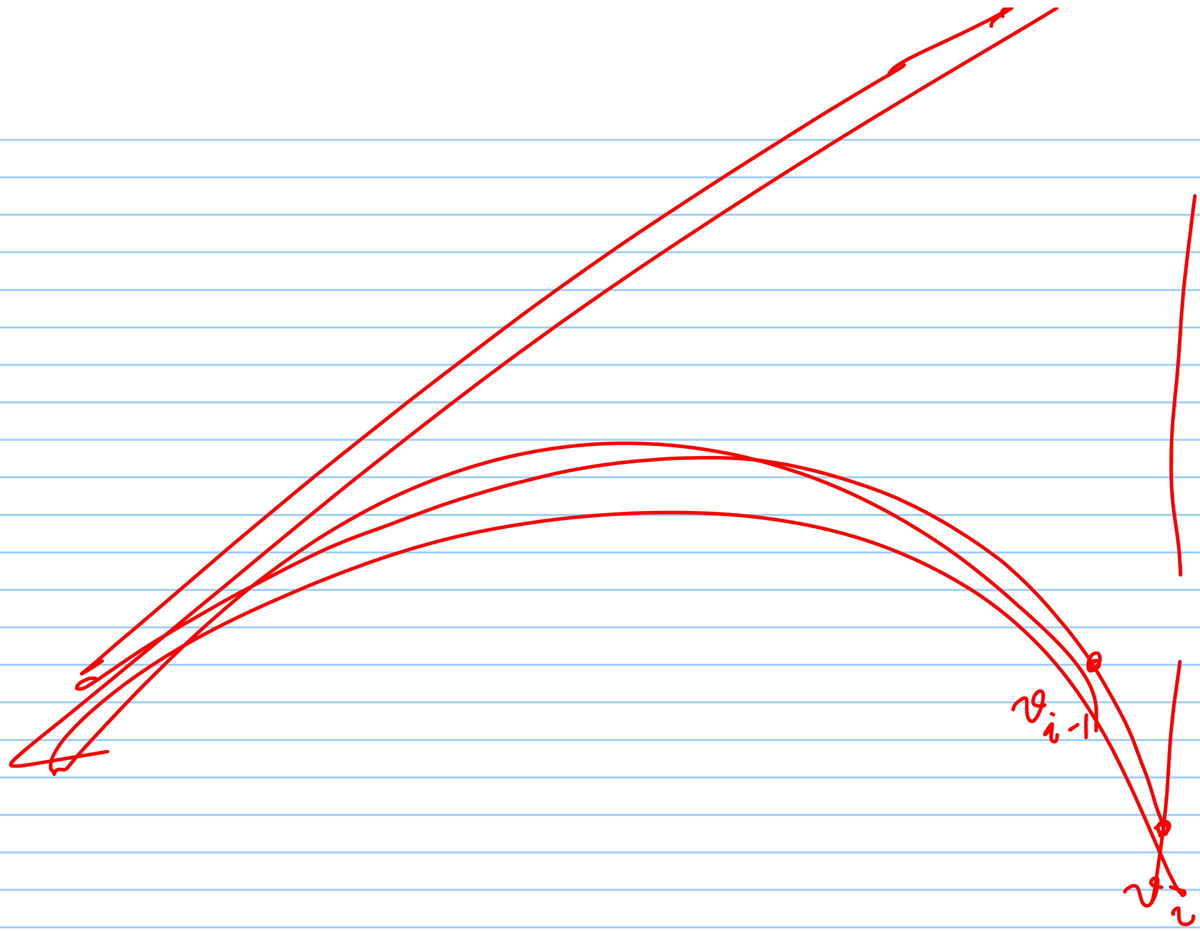




u
v
i-1



u
v_{i-1}
v_i



v_{i-1}
v_i

We can break any polygon into monotone polygon