Topic 1: Geometry

Review, Half-Plane Intersection

Adptive Simpson.

Code review

Python vs. C++

[☆ Course drop / Grade change deadline is earlier for this course!]

Team contest next time

Geometry Reference . . .

Geometry Reference...

Sample Problem:

Given 3 points A, B, C,
find point P s.t. $PA = PB = PC$.

How fast can you solve it?
i.e. How good are you w/ the reference?

Reviews . . .

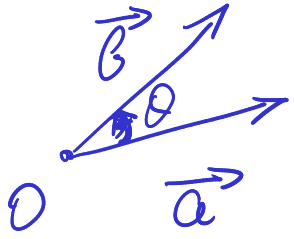
computational Geometry . . .

Point = Vector = (x, y)

Line = $(x_1, y_1) — (x_2, y_2)$

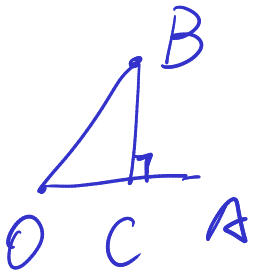
Circle = (x, y) r

det & dot

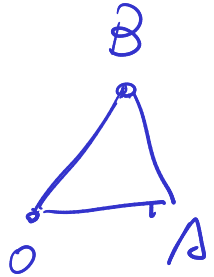


$$\vec{a} \cdot \vec{b} = a.x \cdot b.x + a.y \cdot b.y = |\vec{a}||\vec{b}| \cos\theta$$

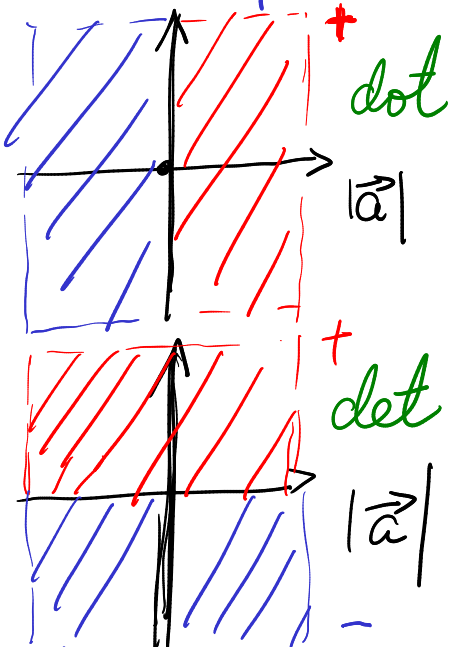
$$\vec{a} \times \vec{b} = a.x \cdot b.y - a.y \cdot b.x = |\vec{a}||\vec{b}| \sin\theta$$



$$\vec{OC} = (\vec{OA} \cdot \vec{OB}) / |\vec{OB}|$$



$$S_{OAB} = (\vec{OA} \times \vec{OB}) / 2$$



Review

Precision

double ~15 digits long double ~30

-- float128 ~60 digits

Speed

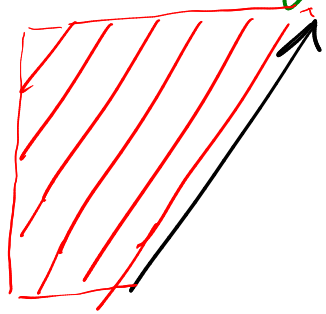
double $\xrightarrow{4\times}$ long double $\xrightarrow{4\times}$ -- float128

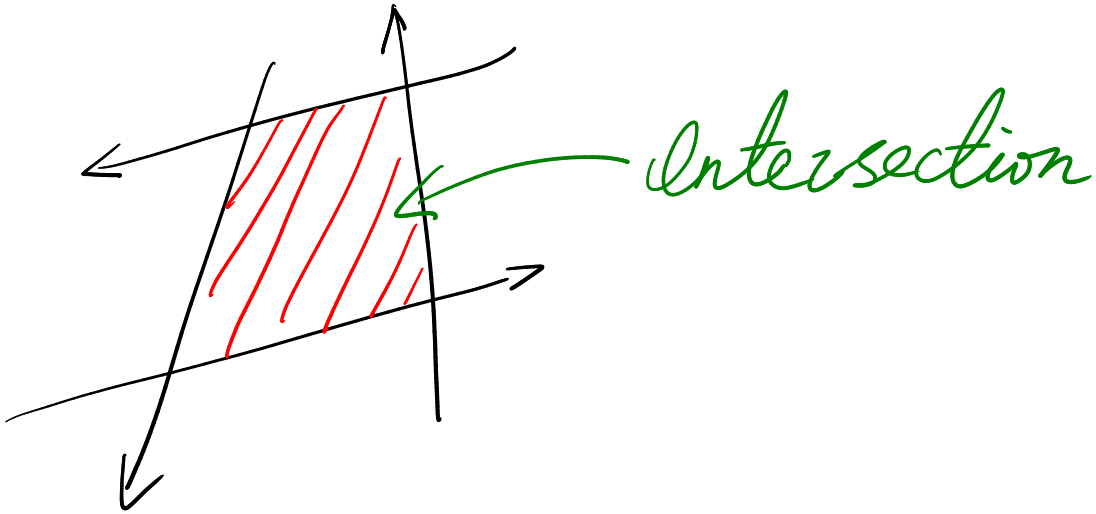
Birthday Cake

Panda Reserve

Half - Plane Intersection

What is a half-plane?



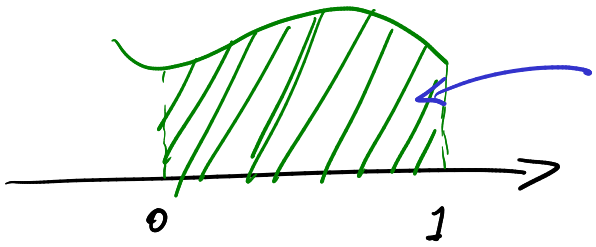


Complexity $O(n \log n)$

Art Gallery

Adaptive Simpson

Numerical integration



$\int_0^1 f(x)\,dx$

Calculus 2 : close-form formula

Competitive Programming :

Divide into small rectangles

Generally works with $\varepsilon = 10^{-6}$ and $f(x)$ takes $O(n)$ to compute

Garden of Thorns

Military Maneuver

Official Solution: Voroni Diagram + Int. on polygon