Complex Analysis

This lecture will be recorded. If you do not want your face in the recording, please turn off your camera. If you do not want your voice in the recording, please participate using the chat.

Check in

Any questions or concerns? Anything unclear?

#2 of warm up

p.10,11

BMPS: A set is open if all of its points are interior points

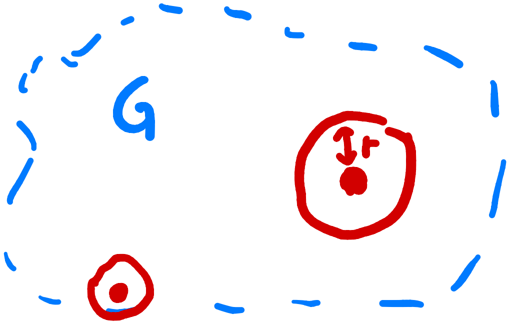
$G \subseteq \mathbb{C}$

A point $a \in G$ is an interior point of G if some open disk with center a is a subset of G

D for disk

$D[a,r] = \{z \in \mathbb{C} : |z-a| < r\}$

" $B(a,r)$ B for ball



Overall BMPS says:

A set G is open if for all $a \in G$ there is an open disk with center a that is inside G.

(implicit that $\exists r > 0$ s.t. r is the radius of this disk)

p.13 of Bowman

$U \subseteq \mathbb{C}$ is open if for every $a \in U$ there is $\varepsilon > 0$ such that $N_\varepsilon(a)$ is entirely contained in U

$$N_\varepsilon(z) = \{ w \in \mathbb{C} : |z - w| < \varepsilon \}$$

$D[a,r] = \{z \in \mathbb{C} : |z-a| < r\}$ BMPS

$N_\varepsilon(a) = \{w \in \mathbb{C} : |a-w| < \varepsilon\}$ Bowman

$|a-w| = |w-a|$

Epsilon neighborhood = open disk of radius ε

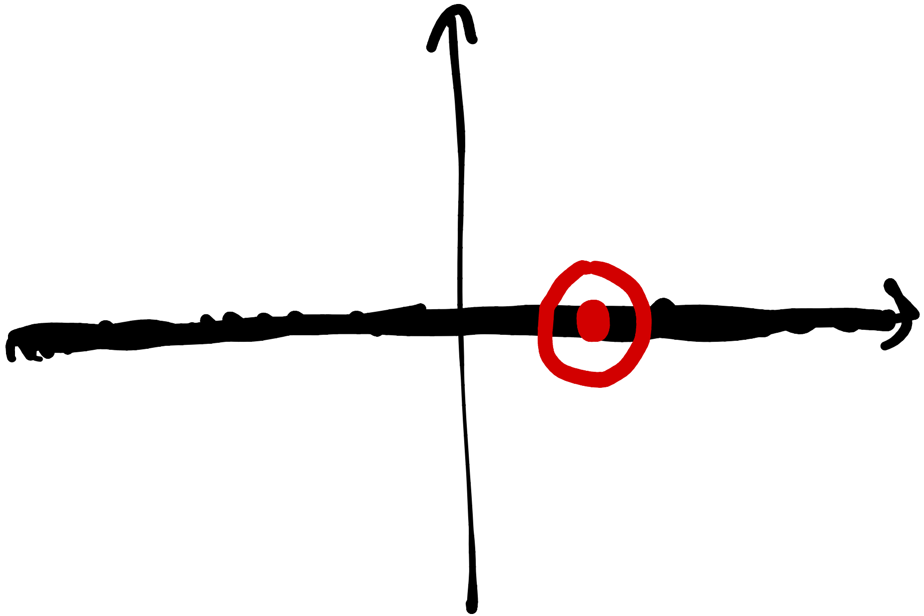
= ball of radius ε

A definition of open that contains both explicitly:

A set $U \subseteq \mathbb{C}$ is <u>open</u> if for every $a \in U$ there exists $r > 0$ such that the ball with radius r and center a is contained fully inside U.

How can that not happen

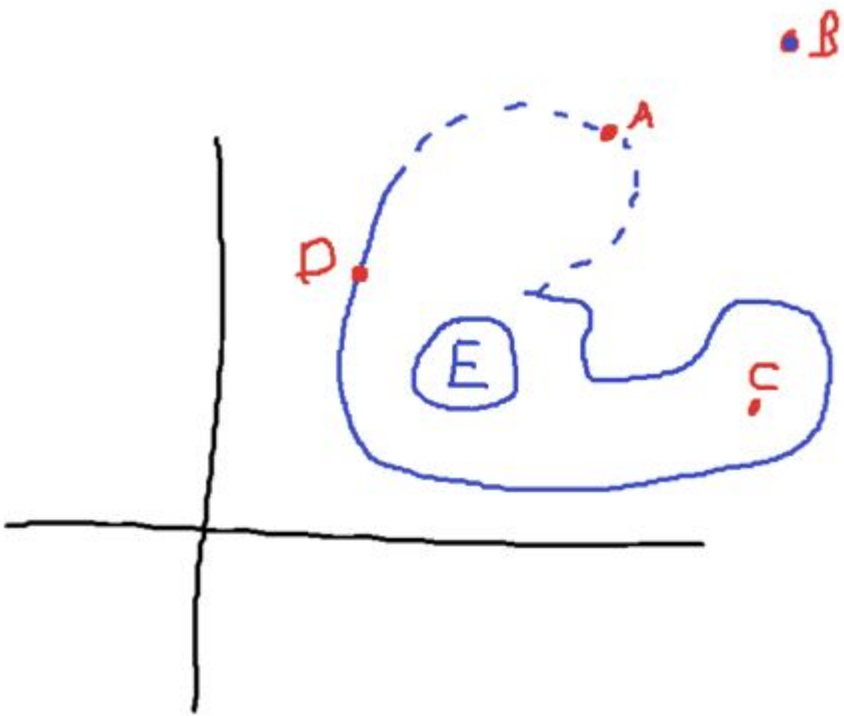
$$A = \{ z \in \mathbb{C} : \mathrm{Im}(z) = 0 \} = \mathbb{R}$$



Think, pair, share

- Think about the problem on your own, jot down ideas
- Pair up (or join in teams of 3-4 students…) to discuss the solutions you each found/the ideas you each had
- Share your group’s answers with the whole class

Problem 1



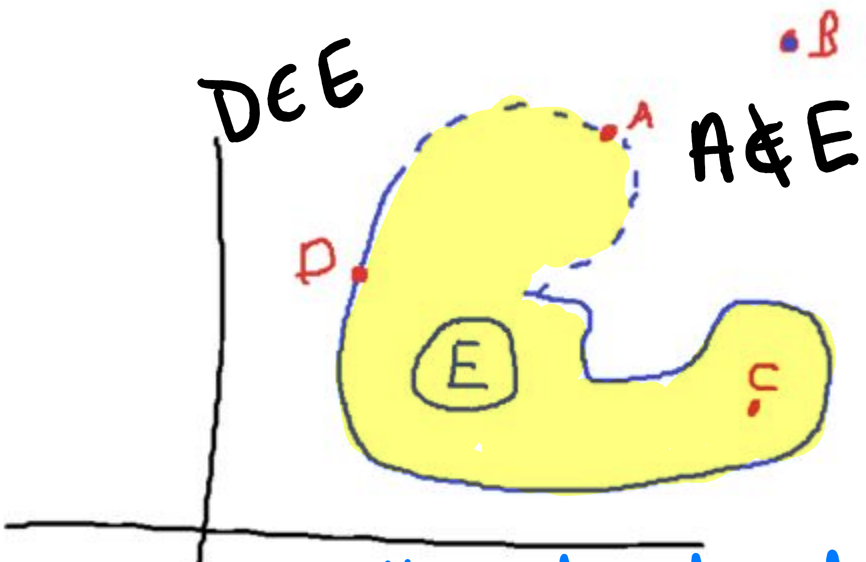
Which of the following four points are interior points of E?

A. A
B. B
C. C
D. D
E. A and D
F. All but A
G. All but C
H. All but D
I. All four points

↖ time

PROBLEM 2

Now: think of this for 5 minutes (until 10:12)



E is the set colored in yellow, including solid line but not dashed line

Which of the following four points are boundary points of E?

A. A
B. B
C. C
D. D
E. A and D
F. All but A
G. All but C
H. All but D
I. All four points

An interior pt is always in the set

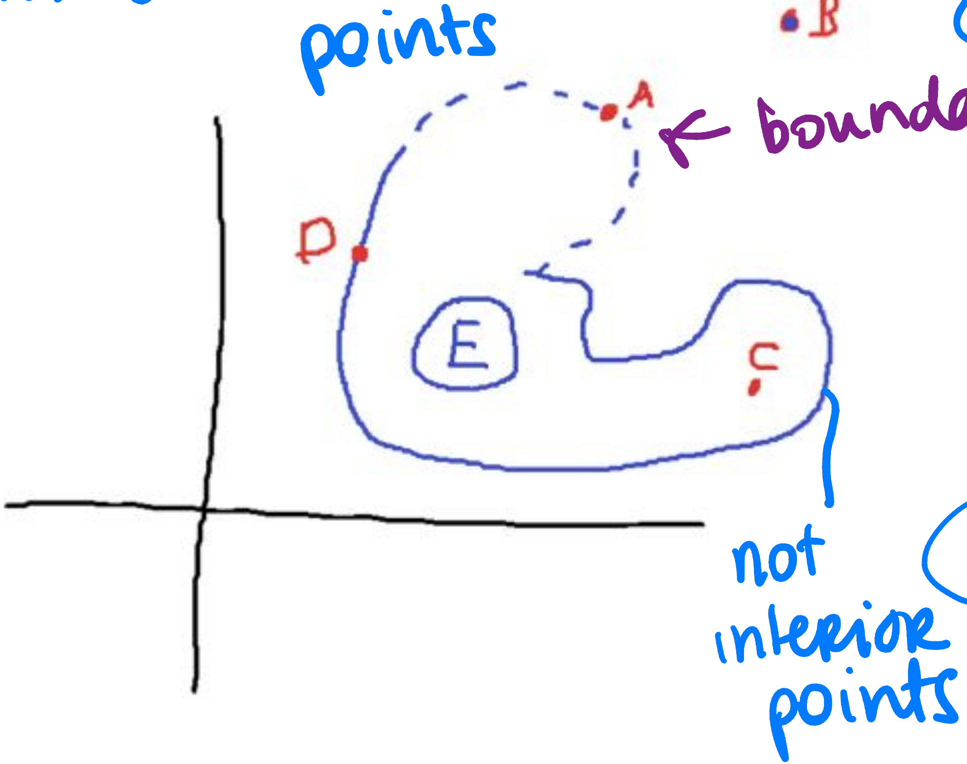
A boundary pt may or may not be in the set

PROBLEM 3

open = only interior points

Is E open?
Is E closed?

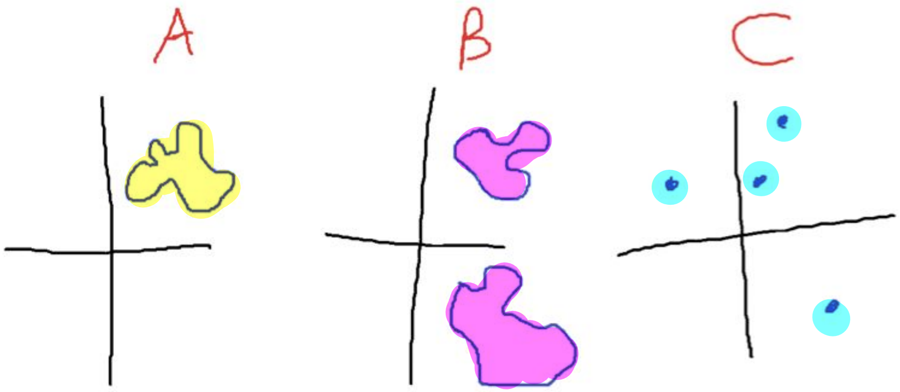
closed = contains all boundary points



The set E is:

A. Open
B. Closed
C. Both
D. Neither

Problem 4



Which of the following sets are connected?

A. A
B. B
C. C
D. A and B
E. A and C
F. B and C
G. All
H. None

LIGHTNING ROUND 1

All subsets of the complex numbers that are not open are closed.

A. True (confident)
B. True (not confident)
C. False (not confident)
D. False (not confident)

Lightning round 2

A = { 4i } is an open set.

A. True (confident)
B. True (not confident)
C. False (not confident)
D. False (confident)

Lightning round 3

A = { 4i } is a closed set.

A. True (confident)
B. True (not confident)
C. False (not confident)
D. False (confident)

Lightning Round 4

Let S be a subset of the complex numbers. Every point of S is either an interior point or a boundary point.

A. True (confident)
B. True (not confident)
C. False (not confident)
D. False (confident)

Lightning round 5

A region is any subset of the complex plane.

A. True (confident)
B. True (not confident)
C. False (not confident)
D. False (confident)

That's all for today!