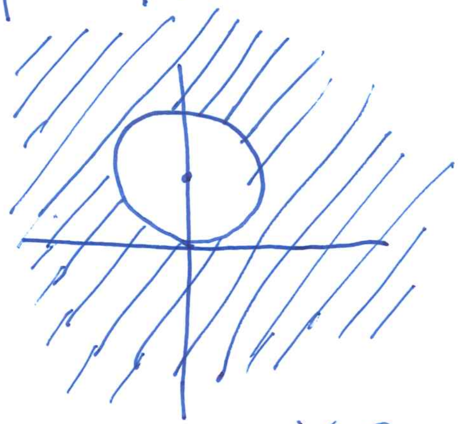
CLASS 5 : FRI JAN 30 2014

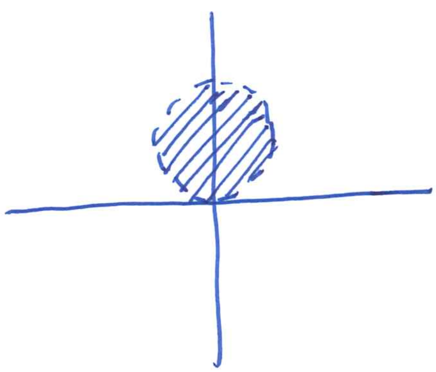
A : $|z-i| \geq 1$



boundary is a circle of radius 1 centered at (0,1)

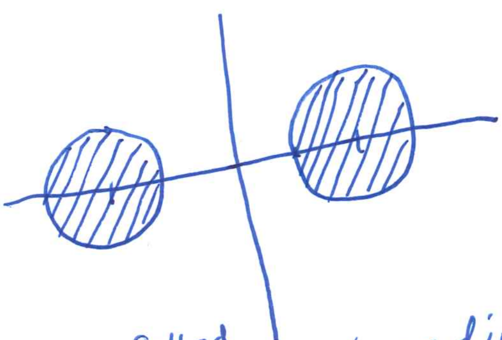
This set is CLOSED because all of its limitpoints are included in the set. The limit points are all the interior points and the boundary points $|z-i|=1$.
This set is CONNECTED since any two points in the set can be reached by polygonal segments.
This set is UNBOUNDED

B : $|z-i| < 1$



This set is OPEN. Every point in the set is an interior point.
This set is CONNECTED and BOUNDED.
This set is thus a DOMAIN (OPEN & CONNECTED)

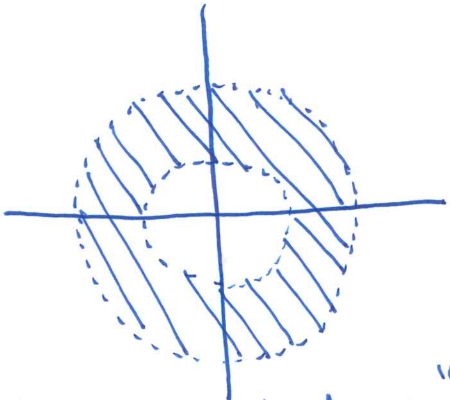
C : $|z+1| \leq \frac{1}{2} \cup |z-1| \leq \frac{1}{2}$



Two filled circles of radius 1/2, one at (-1,0) another at (1,0). Includes the boundaries

This set is CLOSED. (The boundaries are included)
This set is BOUNDED.
COMPACT sets are closed and bounded.
This set is NOT CONNECTED. (No way to move between the two circles and stay in set.)

D : $1<|z|<2$

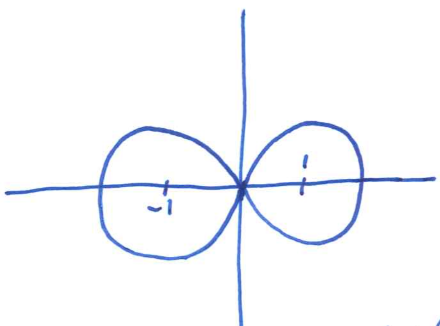


This is called an "annulus." It is the area between two circles of different radius, centered at the origin.

This set is NOT CLOSED.
This set is OPEN.
The points on $|z|=1$ and $|z|=2$ are limit points for the set but are not included.
This set is CONNECTED.
Thus it is a DOMAIN (open & connected).
This set is BOUNDED.
[You can easily imagine a circle drawn ~~around~~ including every point in the set.

E

$|z-1|=1$
$\cup$
$|z+1|=1$

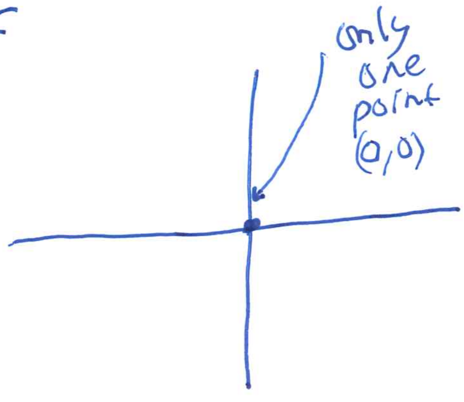


The set consists of the union of two circles of radius 1 centered at (-1, 0) and (1, 0)

This closed set is CONNECTED because it can NOT be divided into the union of 2 disjoint closed sets.

This set is CLOSED.
It has no ~~bound~~ interior points. Every point is a limit point.
This set is BOUNDED.
Thus it is COMPACT.
This set is not OPEN

F



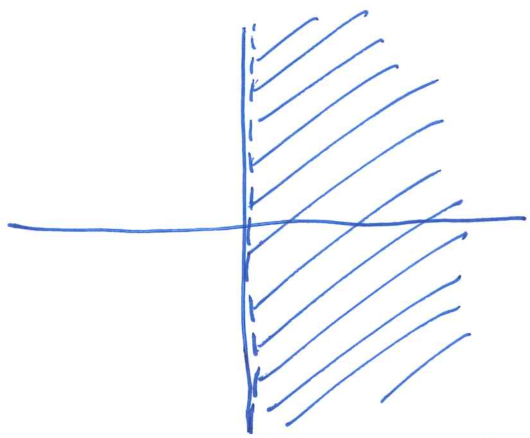
A single point is a compact set.

$|z-1|=1$
$\cap$
$|z+1|=1$

The intersection of the circle of radius 1 at (-1, 0) and circle of radius 1 at (0, 1) is the origin

This set is CLOSED.
It has no limit points and thus by definition contains all of them.
It is NOT CONNECTED.
It is NOT OPEN.
It is BOUNDED

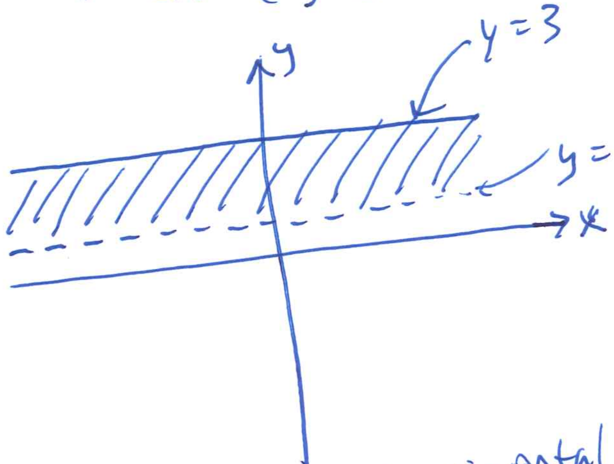
G $Re(z) > 0$



This set is the half-plane (not including the y-axis)

This set is NOT CLOSED.
This set is OPEN.
It does not contain its boundary ($Re(z)=0$).
This set is CONNECTED, so it IS a DOMAIN.

H $1 < Im(z) \leq 3$



This set is the horizontal space between $y=1$ and $y=3$ (includes $y=3$ but not $y=1$)

This set is NOT OPEN (because it includes some boundary points at $y=3$).
This set is NOT CLOSED (it does not include the limit points along $y=1$).
This set is CONNECTED.

This set is NOT BOUNDED.