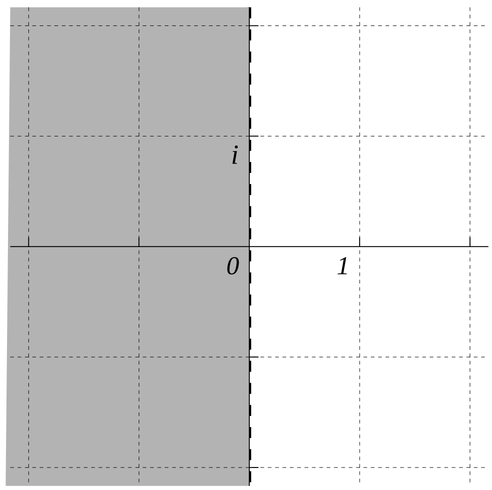
403:01 **How to "draw" some pictures** February 6, 2001

How to "draw" some pictures

I asked: Carefully sketch each of the collections of complex numbers. For each of them, answer the following questions (use Y for "yes" and N for "No"):

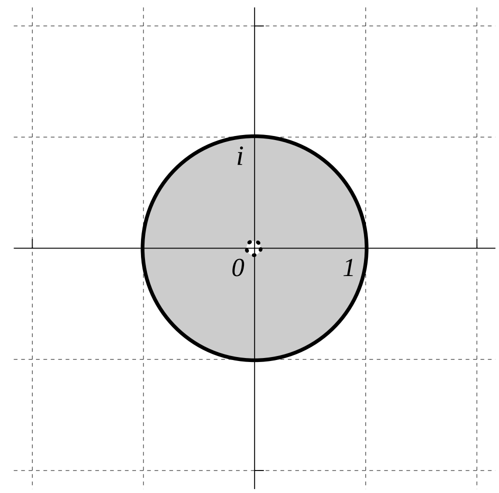
Is this set open? Is this set closed? Is this set a domain?

A: z's so that $\operatorname{Re} z < 0$.



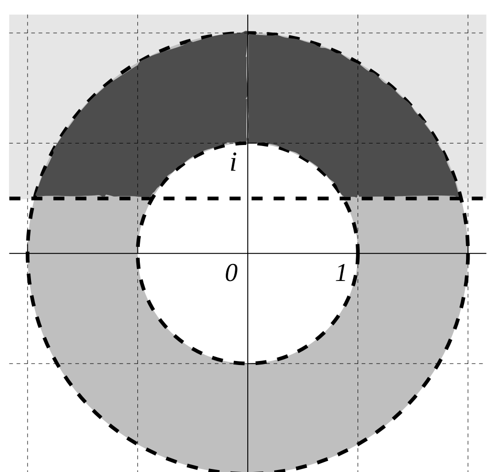
Open? **Y** Closed? **N** A domain? **Y**

B: z's so that $0 < |z| \le 1$.



Open? **N** Closed? **N** A domain? **N**

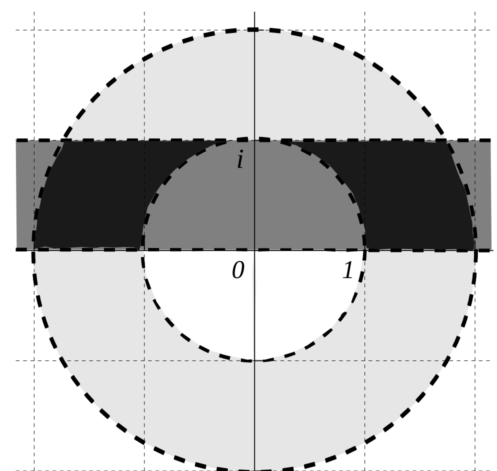
C: z's so that $\frac{1}{2} < \operatorname{Im} z$ and $1 < |z| < 2$.



Open? **Y** Closed? **N** A domain? **Y**

The darkest area is supposed to be C.

D: z's so that $0 < \operatorname{Im} z < 1$ and $1 < |z| < 2$.



Open? **Y** Closed? **N** A domain? **N**

The darkest area is supposed to be D.

The dashed curves/lines in A, B, C, and D indicate boundary points which are not part of the sets. The solid curve in D consists of boundary points which is in the set. Pairs of points in A and C can be connected by polygonal lines in A and C respectively. B is neither open nor closed: 1 is in it and not an interior point so it can't be open; 0 is a boundary point and not in it so it can't be closed. Points in the left half of D can't be connected to points in the right half of D by a polygonal path contained entirely in D because at i there's "no room": that is, the imaginary axis (where $\operatorname{Re} z$=0) is entirely not in the set described in D, so any path entirely in D can't cross it.