

- If the ball $U_r(p)$ is below the x-axis then the ball stays the same.
- The ~~map~~ map f^{-1} has a similar formula and acts on balls in a similar way except the ellipses are rotated in the other direction.

It follows that the preimages of open balls for f are still open and so f is continuous.

(3) Construct a homeomorphism from $[0,1)$ to $(0,2]$.

Let me describe two ways to find such a map.

- (i) to go from $[0,1)$ to $(0,2]$ we have to switch the left and right endpoints. A simple map which does this is

$$x \mapsto -x$$

but this takes $[0,1)$ to $[-1,0]$ so we still need to do some work.

To get the length correct we now need to stretch things by a factor of two. So the map $x \mapsto -2x$ does the job.