Global vs. Local Max/Min

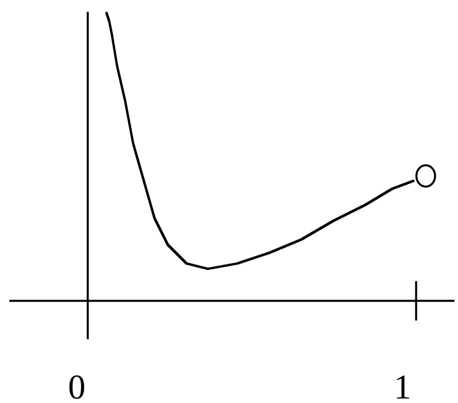
GROUP MEMBERS:

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________

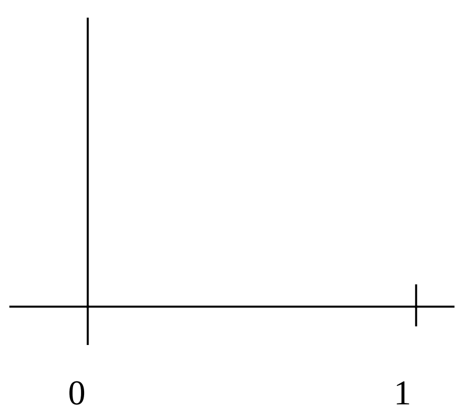
Problem: Find examples when a local max or min is not necessarily the global max or min.

Theorem: A continuous function f(x) defined on a closed, bounded interval [a,b] will attain its (global) maximum and (global) minimum value.

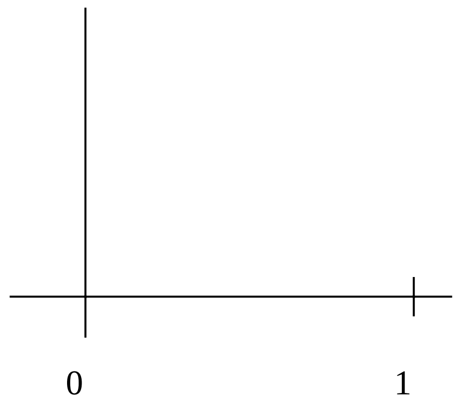
The reason that we need a closed interval [a,b] rather than an open interval (a,b) is illustrated by the following examples. Below is an example of a continuous function on an ***open*** interval (a,b) = (0,1) that attains a minimum value but does not attain a maximum value.



Person 1: Draw a continuous function on the open interval (0,1) that attains a global maximum but does not have a minimum value.

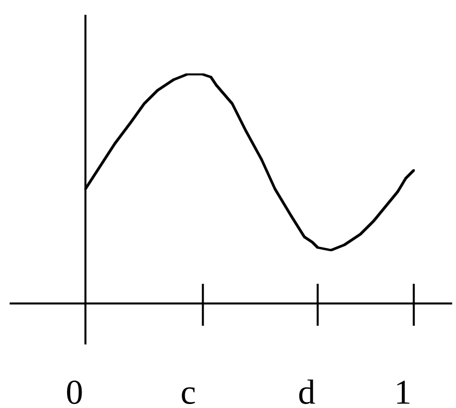


Person 2: Draw a continuous function on the open interval (0,1) that attains neither a maximum nor a minimum value.

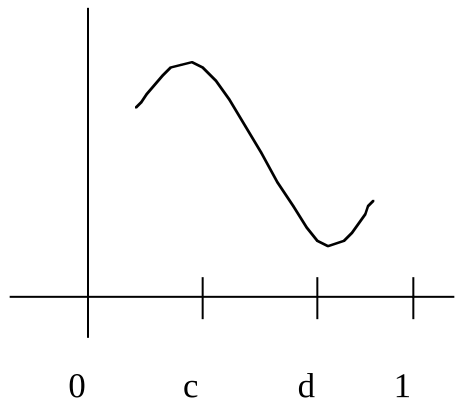


Person 3: Read to the group: Now we will consider closed intervals [a,b] = [0,1]. In the following examples, the points c and d will always be critical points (i.e. f' (c) = f'(d) = 0) for the function. The point c will be a local maximum and the point d will be a local minimum.

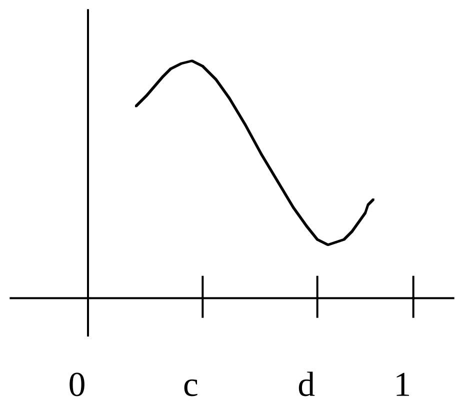
In this example, c is a global maximum and d is a global minimum for the function on the closed interval [0,1].



Person 3: Finish drawing the following graph so that the function has a global minimum at x=0 and a global maximum at x =c yet the point x = 0 is not a critical point.



Person 4: Finish drawing the following graph so that the function has a global minimum at x=d and a global maximum at x =1 yet the point x = 1 is not a critical point.



Person 1: Finish drawing the following graph so that the function has a global minimum at x=0 and a global maximum at x =1 yet the points x = 0 and x =1 are not a critical points.