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CSE/MTH 3312

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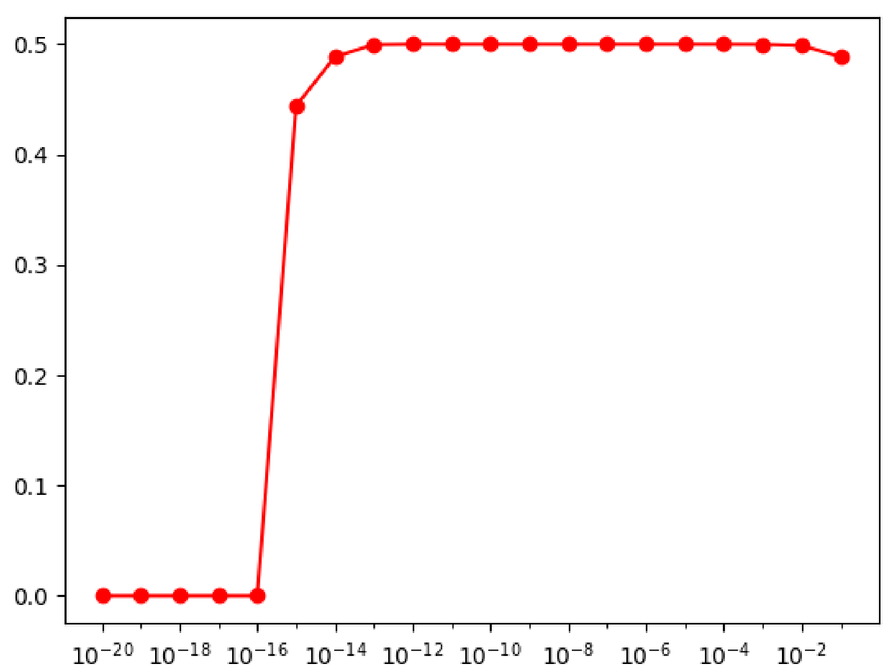
For both programs, *1a.py* and *1d.py*, I used the same exact code other than changing the function. The purpose of both programs is to calculate the limit as x approaches 0 of a given function. I solved the problem by using lists/arrays and a simple for loop where the value was calculated at a specific the x was then divided by 10 and the loop repeated. The output on both programs is the list of values calculated by the given functions.

1)

A) The values calculated by the program were [0.4880884817015163, 0.498756211208895, 0.4998750624609638, 0.49998750062396624, 0.4999987500031721, 0.49999987505877636, 0.4999999880794802, 0.4999999969612644, 0.5000000413701854, 0.5000000413701854, 0.5000000413701854, 0.5000444502911704, 0.4996003610813204, 0.4884981308350688, 0.44408920985006256, 0.0, 0.0, 0.0, 0.0, 0.0]

B)



C)

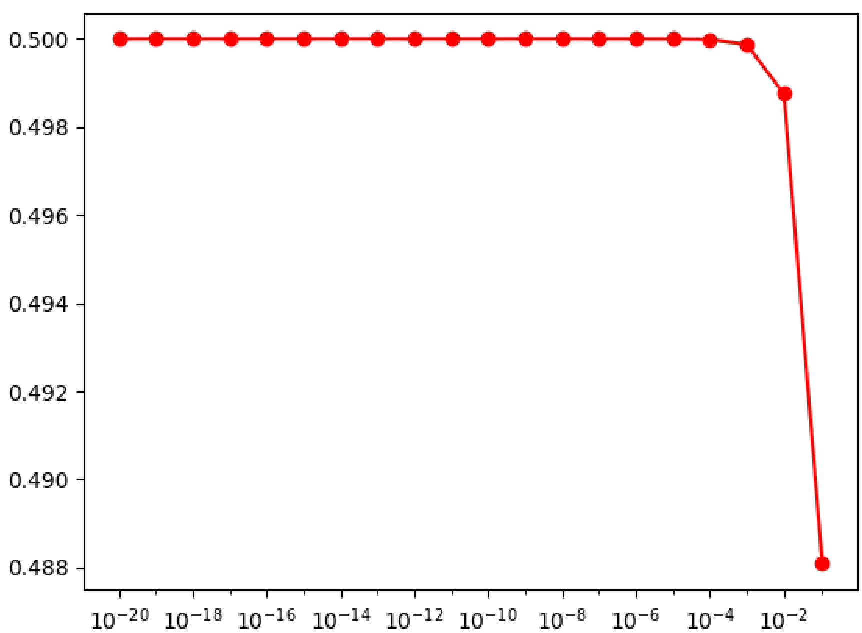
$$\lim_{x \to 0} \frac{\sqrt{1+x} - 1}{x} = \frac{0}{0}$$

After calculating the limit of the function above, the calculations the program gave are in fact consistent with the limit since dividing by essentially zero causes the calculation in the computer to go to zero.

D)

A) The output the computer gives with the given function is: [0.4880884817015155, 0.4987562112089027, 0.49987506246096475, 0.49998750062496095, 0.49999875000625, 0.49999987500006243, 0.49999998750000063, 0.49999999875, 0.499999999875, 0.4999999999875, 0.49999999999875, 0.499999999999875, 0.49999999999998757, 0.4999999999999988, 0.4999999999999999, 0.5, 0.5, 0.5, 0.5, 0.5]

B)



C)

$$\lim_{x \to 0} \frac{1}{\sqrt{1+x}+1} \qquad \frac{1}{\sqrt{1}+1} = \frac{1}{2}$$

After calculating the limit of the function above, the computer calculations are consistent with the limit of the function at 0. Since we are never dividing by a number close to zero we won't get a NaN value, infinity, or error. Instead as x shrinks we will get closer and closer to exactly ½, which is shown by the output of the program.