**HW 2 CS384**

5b.

10-5 accuracy output:

step: 0 MidPoint: 0.5

step: 1 MidPoint: 0.25

step: 2 MidPoint: 0.375

step: 3 MidPoint: 0.3125

step: 4 MidPoint: 0.28125

step: 5 MidPoint: 0.26562

step: 6 MidPoint: 0.25781

step: 7 MidPoint: 0.25391

step: 8 MidPoint: 0.25586

step: 9 MidPoint: 0.25684

step: 10 MidPoint: 0.25732

step: 11 MidPoint: 0.25757

step: 12 MidPoint: 0.25745

step: 13 MidPoint: 0.25751

step: 14 MidPoint: 0.25754

step: 15 MidPoint: 0.25752

step: 16 MidPoint: 0.25753

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Total Number of Steps: 16

The root of the function is: 0.25753

10-10 accuracy output:

step: 0 MidPoint: 0.5

step: 1 MidPoint: 0.25

step: 2 MidPoint: 0.375

step: 3 MidPoint: 0.3125

step: 4 MidPoint: 0.28125

step: 5 MidPoint: 0.265625

step: 6 MidPoint: 0.2578125

step: 7 MidPoint: 0.25390625

step: 8 MidPoint: 0.255859375

step: 9 MidPoint: 0.2568359375

step: 10 MidPoint: 0.2573242187

step: 11 MidPoint: 0.2575683594

step: 12 MidPoint: 0.2574462891

step: 13 MidPoint: 0.2575073242

step: 14 MidPoint: 0.2575378418

step: 15 MidPoint: 0.257522583

step: 16 MidPoint: 0.2575302124

step: 17 MidPoint: 0.2575340271

step: 18 MidPoint: 0.2575321198

step: 19 MidPoint: 0.2575311661

step: 20 MidPoint: 0.2575306892

step: 21 MidPoint: 0.2575304508

step: 23 MidPoint: 0.257530272

step: 24 MidPoint: 0.2575303018

step: 25 MidPoint: 0.2575302869

step: 26 MidPoint: 0.2575302795

step: 27 MidPoint: 0.2575302832

step: 28 MidPoint: 0.257530285

step: 29 MidPoint: 0.257530286

step: 30 MidPoint: 0.2575302855

step: 31 MidPoint: 0.2575302853

step: 32 MidPoint: 0.2575302854

step: 33 MidPoint: 0.2575302855

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Total Number of Steps: 33

The root of the function is: 0.2575302855

The number of steps it took from 10-5 was 16 steps while 10-10 took about double that amount at 33 steps.

Before the loop is executed I calculate f(0) and f(1) to make sure they have opposite signs, telling me that there is a root inside the continuous function by the definition of the intermediate value theorem.

14.

To find the appropriate interval I graphed it on my graphing calculator to find that the zero was in between [1,2], then I double checked and made sure the values had opposite signs (this is done in the beginning of the function before I start looping.)

10-4 accuracy output:

step: 0 MidPoint: 1.5

step: 1 MidPoint: 1.75

step: 2 MidPoint: 1.625

step: 3 MidPoint: 1.6875

step: 4 MidPoint: 1.7187

step: 5 MidPoint: 1.7344

step: 6 MidPoint: 1.7266

step: 7 MidPoint: 1.7305

step: 8 MidPoint: 1.7324

step: 9 MidPoint: 1.7314

step: 10 MidPoint: 1.7319

step: 11 MidPoint: 1.7322

step: 12 MidPoint: 1.7321

step: 13 MidPoint: 1.732

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Total Number of Steps: 13

The root of the function is: 1.732

Before the loop is executed I checked the answers f(1) and f(2) to make sure they have opposite signs, telling me that there is a root inside the continuous function by the definition of the intermediate value theorem. The reason I choose the interval [1,2] instead of [0,1], was because of the graph of the function x2-3 has a zero that looked to be in-between [1,2]. I did double check the interval [0,1] and it wouldn’t have worked because it produces two negative numbers.

The number of steps this Bisection took on the function x2-3 with 10-4 accuracy was 13 steps.