Root Finding questions

For the bisection bethod
What does the method do?
The bisection method looks at increasingly smaller intervals to find a root of a function.

What is required for the method to work?

For this method to work you need a function that is continuous on the given interval [a,b], and the interval [a,b] itself.

For the fixed point iteration

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What problem is the fixed point iteration trying to solve?
The general case it is trying to solve the same problem, where the roots of the function are unknown and we compare the function to y = x where the given function is larger at the start of the interval and smaller at the end of the interval.

Exercises

```
(base) PS C:\Users\quinn\OneDrive\Documents\APPM 4600> python .\bisection_example.py
the approximate root is 0.9999999701976776
the error message reads: 0
f(astar) = -2.98023206113385e-08
(base) PS C:\Users\quinn\OneDrive\Documents\APPM 4600> python .\bisection_example.py
the approximate root is -1
the error message reads: 1
f(astar) = -2
(base) PS C:\Users\quinn\OneDrive\Documents\APPM 4600> python .\bisection_example.py
the approximate root is 0.9999999701976776
the error message reads: 0
f(astar) = -2.98023206113385e-08
```

1. This picture shows the calculated roots for each given interval. The second interval didn't work because the root wasn't in it. x=0 also doesn't appear using this bisection method.

```
                    ^^^^
  File "C:\Users\quinn\OneDrive\Documents\APPM 4600\bisection_example.py", line 7, in <lambda>
    f = lambda x: (x-1)(x-3)(x-5)
                  ^^^^^^^^^^
TypeError: 'int' object is not callable
(base) PS C:\Users\quinn\OneDrive\Documents\APPM 4600> python .\bisection_example.py
the approximate root is 0.9999999850988388
the error message reads: 0
f(astar) = -1.490116074975845e-08
(base) PS C:\Users\quinn\OneDrive\Documents\APPM 4600> python .\bisection_example.py
the approximate root is 1.0000030517578122
the error message reads: 0
f(astar) = 2.4414006618542327e-05
(base) PS C:\Users\quinn\OneDrive\Documents\APPM 4600> python .\bisection_example.py
the approximate root is 0
the error message reads: 1
f(astar) = -3
(base) PS C:\Users\quinn\OneDrive\Documents\APPM 4600> python .\bisection_example.py
the approximate root is 0
the error message reads: 0
f(astar) = 0.0
(base) PS C:\Users\quinn\OneDrive\Documents\APPM 4600> python .\bisection_example.py
the approximate root is 0
the error message reads: 0
f(astar) = 0.0
(base) PS C:\Users\quinn\OneDrive\Documents\APPM 4600> python .\bisection_example.py
the approximate root is 0.5
the error message reads: 1
f(astar) = 0.479425538604203
```

2.

This screenshot shows the functions and intervals with the bisection method for question 2. The second to last operation was a mistake, and the last two legitimate operations don't have the ideal accuracy.