Explanation

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# Choice of g(x):

This g(x) was selected as it was easy to compute with instead of other g(x) that I composed. Some were diverging while some were getting undefined so this g(x) was selected as a suitable equation. While its derivative was tedious, it was still <1 which indicated that it will converge. It took 33 iterations to get to root with accuracy of 10-20.

# Comparison of iterations and CPU time:

|  |  |  |  |
| --- | --- | --- | --- |
| **Method** | **Iterations** | **CPU Time (s)** | **Convergence Sequence** |
| Newton Method | 7 | 0.014000654220581055 | Quadratic |
| Fixed Point Iteration | 33 | 0.014000892639160156 | Linear |

It is clearly shown that the number of iterations of Newton method is lesser than the number of iterations of Fixed Point Iteration. Newton method is a higher order method, and thus builds better approximation of your function. Newton method typically exactly minimizes the second order approximation of a function. As the number of iterations is lower, CPU time also decreases for Newton Method, it may not be much significant in this example but the difference is there.

# Asymptotic Constant:

|  |  |  |
| --- | --- | --- |
|  | **Newton Method** | **Fixed Point Method** |
| 1 | 0.12389040191758522724 | 0.32235861161715712031 |
| 2 | 0.01739069851987235654 | 0.33554024723962017074 |
| 3 | 0.00030806194205764320 | 0.33961715293529526338 |
| 4 | 0.00000009411697421473 | 0.34096633785666974337 |

The sequence of Newton method is converging at a faster rate than F.P.M. Sequence of F.P.M is converging linearly compared to N.M which is converging quadratic-ally. This indicates that we will reach our result quickly in NM. And it is shown as N.M concludes its result in 7 iterations.