

Multiple Roots

Write a program that computes the root ($\alpha=1.1$) of the following equation using Newton's method.

$$f(x) = (x - 1.1)^3 (x - 2.1)$$

Choose initial boundary point as 0.8 and error tolerance as 0.001. Write the numerical output in formatted text as shown below. Please also draw the solution graphically.

Sample output of the program.

| n | x_n | $f(x_n)$ | $\alpha - x_n$ | Ratio |
|-----|----------|----------|----------------|-------|
| 0 | 0.800000 | 0.03510 | 0.300000 | |
| 1 | 0.892857 | 0.01073 | 0.207143 | 0.690 |
| 2 | 0.958176 | 0.00325 | 0.141824 | 0.685 |
| 3 | 1.00344 | 0.00099 | 0.09656 | 0.681 |
| 4 | 1.03486 | 0.00029 | 0.06514 | 0.675 |
| 5 | 1.05581 | 0.00009 | 0.04419 | 0.678 |
| 6 | 1.07028 | 0.00003 | 0.02972 | 0.673 |
| 7 | 1.08092 | 0.0 | 0.01908 | 0.642 |

where Ratio = $\frac{\alpha - x_n}{\alpha - x_{n-1}}$

Compare your result with Bisection method and comment on the convergence.

Bonus: Recompute the same root using the modified Newton's method