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ENGG 27.01 - M

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Progress Report 2 for Project 1: Fixed-Point Approach for Finding Roots of Polynomials

As of February 5, 2026, major progress has been made on the project, including integration of `is_int()` and `is_floating_pt()` functions, header implementation, more robust file validation, and stricter user input validation.

Integration of `is_int()` and `is_floating_pt()` functions was necessary in validating the degree of the polynomial in the polynomial file and validating user input as a double-precision floating point number. As such, their corresponding headers and their implementation were added to the project.

From there, various program functions such as reading the polynomial file and calculating for the polynomial roots via the fixed-point approach were programmed separately from the main program through header implementation, compartmentalizing the program and making it more readable.

File validation was made more robust by fixing the functionality that a default file called 'test' would open should the user not input any polynomial file. Additionally, the program will continuously request for a polynomial file to open, should the user input an invalid polynomial file name or the program fail to open the user-inputted file.

Lastly, user input validation was implemented, specifically for the polynomial file as mentioned earlier and for the initial guess $g(0)$. Due to the algebraic techniques used to derive $g(x)$ as a rational function, the program will fail to return any results should the user input $g(0) = 0$. So, the program is will now continuously ask for a valid initial guess $g(0)$ should the user input an invalid double-precision floating point number or 0.

Due to this progress, the program is largely complete. Further progress includes checking the program's compliance with the detailed specifications.

```

pedr0@pedr0: ~/Desktop/Estacio_Peter$ ./main
Enter filename (defaults to 'test'):
POLYNOMIAL file is valid.
Polynomial of index 3 read.
=====
Initial Guess (g_0): 0
Invalid guess. Try again: asd
Invalid guess. Try again: 1
=====
Showing estimates for i = 3:
x_0 = 1
x_1 = 17.4
x_2 = -1.01723
x_3 = -1.95312
x_4 = -4.05105
x_5 = -3.39697
x_6 = -3.61145
x_7 = -3.5375
x_8 = -3.56262
x_9 = -3.55404
x_10 = -3.55696
x_11 = -3.55597
x_12 = -3.55631
x_13 = -3.55619
x_14 = -3.55623
x_15 = -3.55622
x_16 = -3.55622
x_17 = -3.55622
x_18 = -3.55622
x_19 = -3.55622
x_20 = -3.55622
x_21 = -3.55622
x_22 = -3.55622
x_23 = -3.55622
x_24 = -3.55622
x_25 = -3.55622
x_26 = -3.55622
x_27 = -3.55622
x_28 = -3.55622
x_29 = -3.55622
x_30 = -3.55622
x_31 = -3.55622
x_32 = -3.55622
x_33 = -3.55622
x_34 = -3.55622
x_35 = -3.55622
x_36 = -3.55622
x_37 = -3.55622
x_38 = -3.55622
Converged. Final result: -3.5562190082267491
=====

Showing estimates for i = 2:
x_0 = 1
x_1 = 11.25
x_2 = -72.5793
x_3 = -3286.43
x_4 = -6.75039e+06
x_5 = -2.84798e+13
x_6 = -5.06938e+26
x_7 = -1.60617e+53
x_8 = -1.61235e+106
Diverged. Iterations stopped.
=====
Showing estimates for i = 1:
x_0 = 1
x_1 = -0.708333
x_2 = -0.932564
x_3 = -0.918703
x_4 = -0.919268
x_5 = -0.919244
x_6 = -0.919245
x_7 = -0.919245
x_8 = -0.919245
x_9 = -0.919245
x_10 = -0.919245
x_11 = -0.919245
x_12 = -0.919245
x_13 = -0.919245
Converged. Final result: -0.91924522833031541
=====
pedr0@pedr0: ~/Desktop/Estacio_Peter$

```

sample screenshots – program executable run and example results

```

* Executing task: C/C++: LINUX BUILD (g++)

Starting build...
/usr/bin/g++ -fdiagnostics-color=always -g *.cpp -o '/home/pedr0/Documents/Coding/ENGG 27 - 2/Project 1/main'

Build finished successfully.
* Terminal will be reused by tasks, press any key to close it.

```

sample screenshot – compilation on Visual Studio Code

```

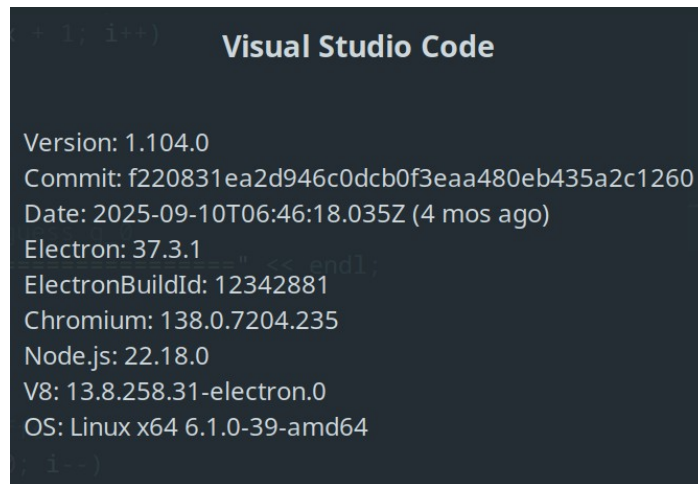
pedr0@pedr0: ~/Documents/Coding$ g++ --version
g++ (Debian 12.2.0-14+deb12u1) 12.2.0
Copyright (C) 2022 Free Software Foundation, Inc.
This is free software; see the source for copying conditions. There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

```

compiler version – g++ (Debian 12.2.0-14+deb12u1) 12.2.0

Operating System	Debian GNU/Linux 12 bookworm (x86-64)
Cinnamon Version	5.6.8
Linux Kernel	6.1.0-39-amd64
Processor	Intel® Core™ i5-8250U CPU @ 1.60GHz × 4
Memory	15.5 GiB
Hard Drives	628.6 GB
Graphics Card	Intel Corporation UHD Graphics 620
Upload system information	
Copy to clipboard	

operating system – Debian 12 bookworm, Cinnamon version 5.6.8



IDE – Visual Studio Code ver 1.104.0