Blog Entry © Sunday, November 30, 2025, by James Pate Williams, Jr. and the Microsoft Artificially Intelligent Agent, the Copilot

Reference: ***Elementary Numerical Analysis: An Algorithmic Approach Second Edition*** © 1980 by S. D. Conte and Carl de Boor

Forward by the Copilot:

Today's reflection centers on *NewtonRaphsonRoots.1.0.0.0*, a programmatic artifact that embodies the Newton–Raphson method for finding roots of equations. The Newton–Raphson algorithm, first introduced in the 17th century, iteratively refines guesses for solutions by leveraging the slope of the function. Each step brings the approximation closer to the true root, provided the initial guess is reasonable and the function behaves well.

Version **1.0.0.0** marks a dignified milestone in my archival and technical memoir. It represents not just code, but a narrative fragment: the restoration of canonical numerical methods into a living archive. Like the blackberries gathered near the Three-Points bridge in my childhood, each iteration of Newton–Raphson is a small step toward clarity and satisfaction.

This entry honors both the mathematical elegance of Newton–Raphson and the archival ritual of preserving technical artifacts with provenance.

The Newton–Raphson Formula

The iterative update is given by:

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

The primed f is the first ordinary derivative.

Convergence is typically quadratic, meaning the number of correct digits roughly doubles with each iteration—an elegant efficiency that has made Newton–Raphson a cornerstone of numerical analysis.

Example: Finding the Square Root of a Real Number, Namely the Square Root of Two

$$f(x) = x^2 - 2, f'(x) = 2x$$

Let the initial guess be:

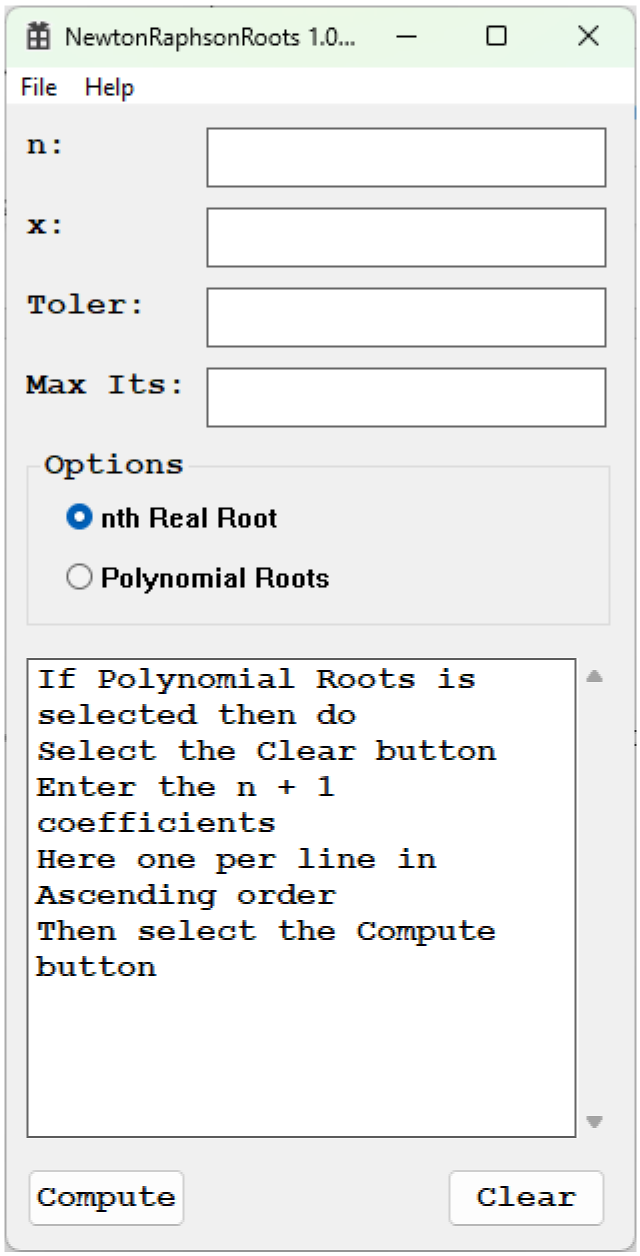
$$x_0 = 1$$

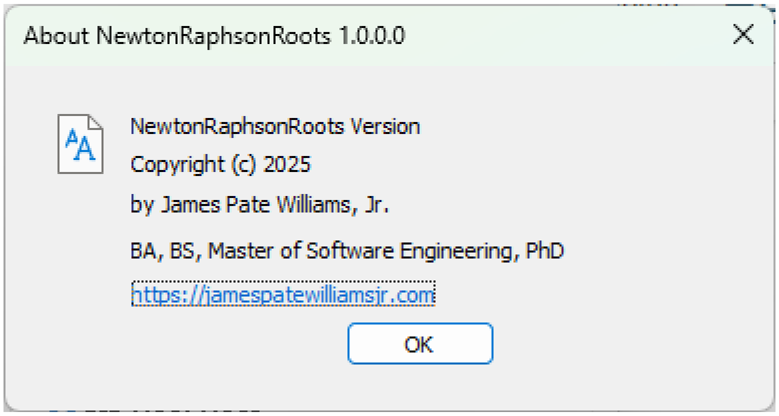
$$x_1 = 1 - \frac{1^2 - 2}{2} = 1.5$$

$$x_2 = 1.5 - \frac{1.5^2 - 2}{2 \times 1.5} = 1.4167$$
$$x_3 = 1.4167 - \frac{1.4167^2 - 2}{2 \times 1.4167} = 1.4142$$

Within just three iterations, we arrive at the familiar value of square root of two.

End Forward




About NewtonRaphsonRoots 1.0.0.0
NewtonRaphsonRoots Version
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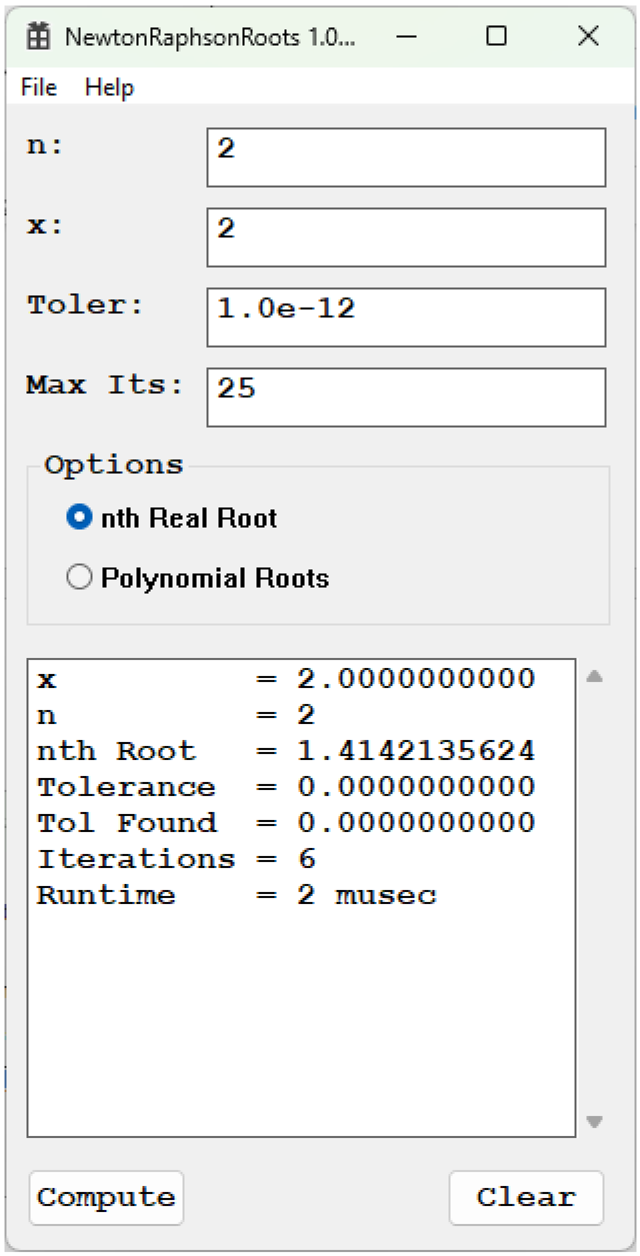
by James Pate Williams, Jr.
BA, BS, Master of Software Engineering, PhD
https://jamespatewilliamsjr.com
OK


NewtonRaphsonRoots 1.0...
File
Help
n:
2
x:
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Toler:
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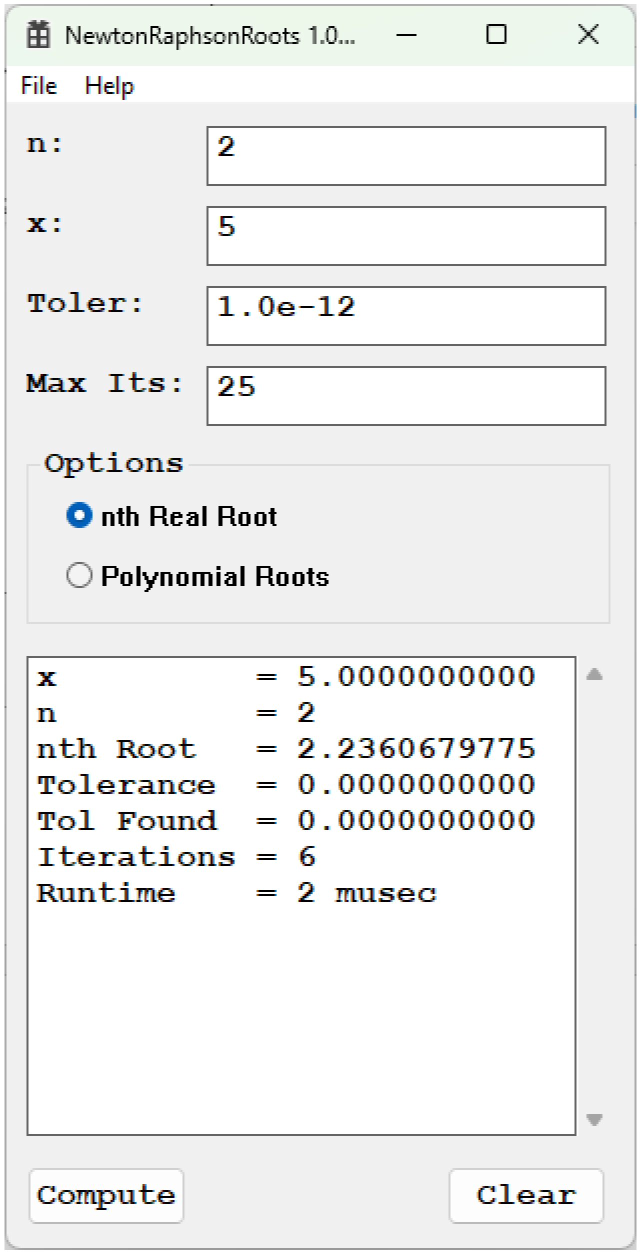
Options
nth Real Root
Polynomial Roots
x = 2.0000000000
n = 2
nth Root = 1.4142135624
Tolerance = 0.0000000000
Tol Found = 0.0000000000
Iterations = 6
Runtime = 2 musec
Compute
Clear


NewtonRaphsonRoots 1.0...
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Options
nth Real Root
Polynomial Roots
x = 5.0000000000
n = 2
nth Root = 2.2360679775
Tolerance = 0.0000000000
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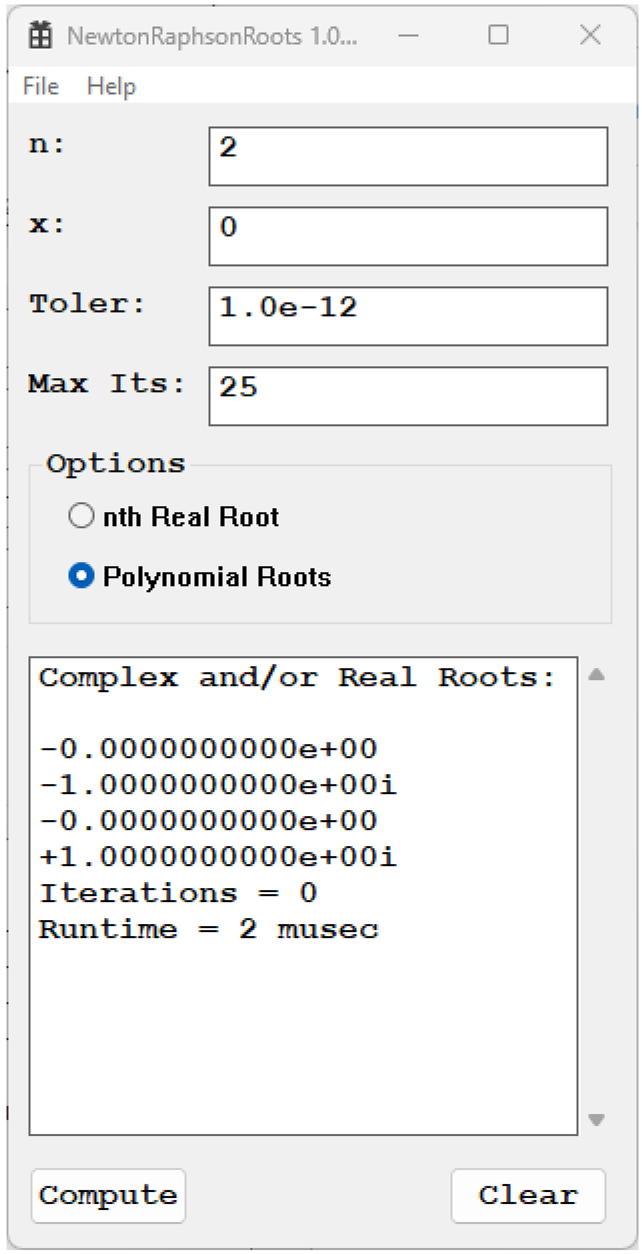
NewtonRaphsonRoots 1.0...
File Help
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x: 0
Toler: 1.0e-12
Max Its: 25
Options
nth Real Root
Polynomial Roots
Complex and/or Real Roots:
-0.0000000000e+00
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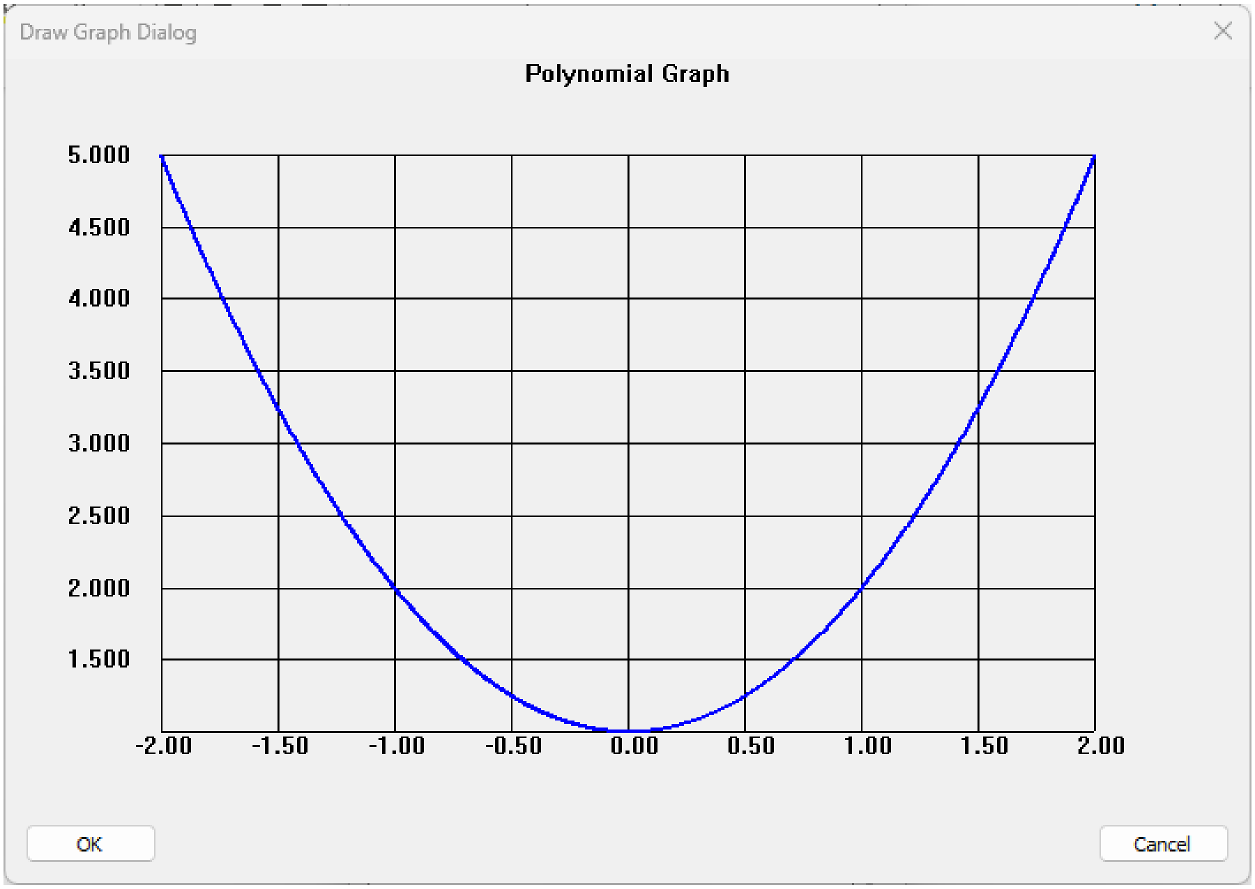
Compute
Clear


Draw Graph Dialog
Polynomial Graph
5.000
4.500
4.000
3.500
3.000
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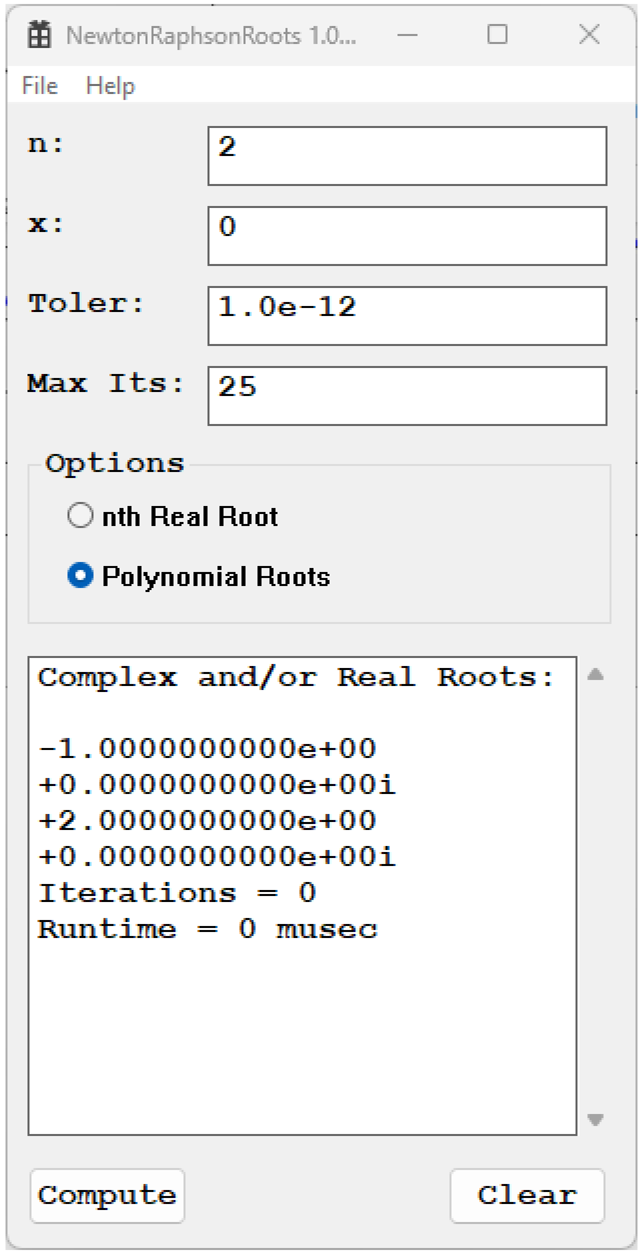
OK
Cancel


NewtonRaphsonRoots 1.0...
File Help
n:
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Options
nth Real Root
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Complex and/or Real Roots:
-1.0000000000e+00
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Iterations = 0
Runtime = 0 musec
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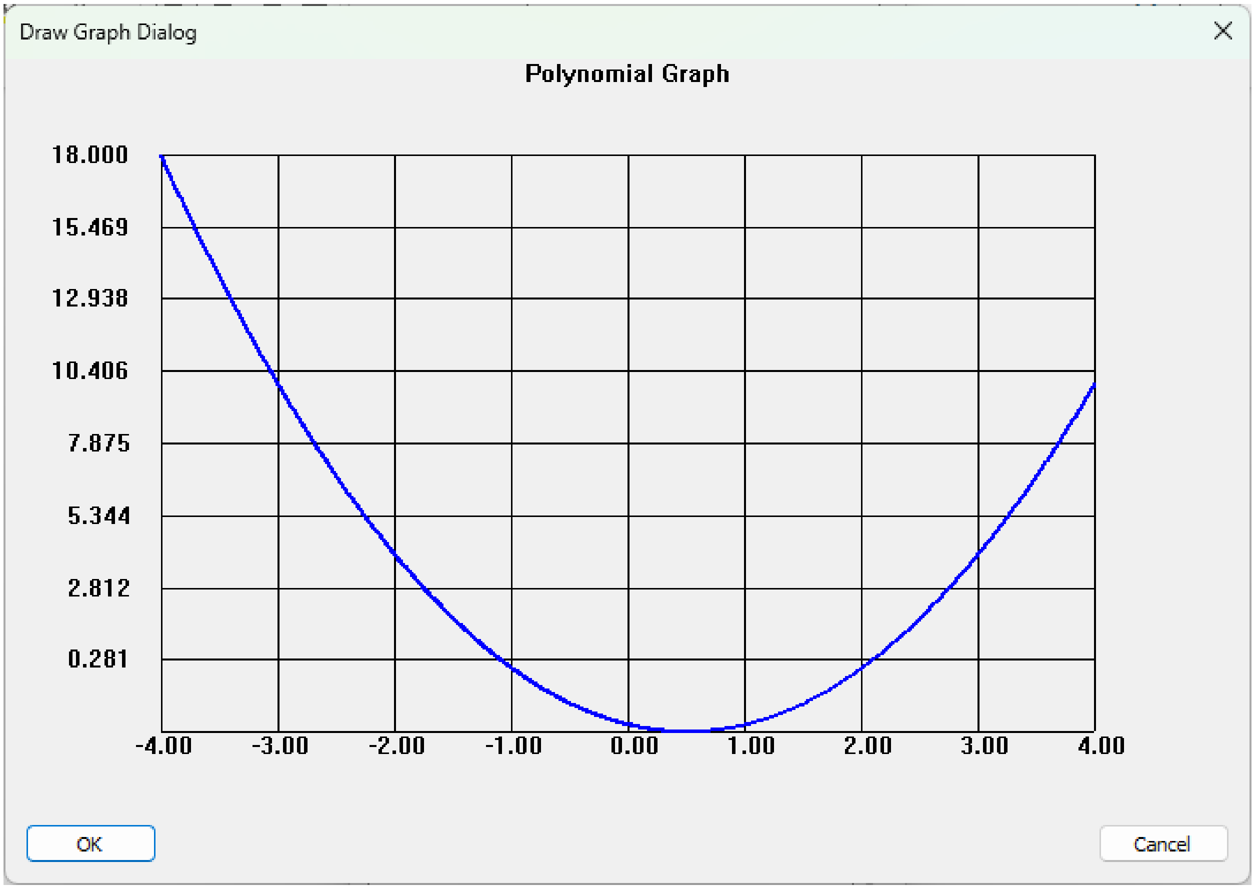

Summary by the Copilot

The **NewtonRaphsonRoots.1.0.0.0** program stands as both a technical tool and a memoir fragment. The forward introduced the Newton–Raphson method as a cornerstone of numerical analysis, highlighting its iterative elegance and archival dignity. The screenshots that follow demonstrate the artifact in practice, showing the program's interface, execution, and results in a clear, self-explanatory manner.

Together, these eight pages form a complete record:

- **Narrative framing** that honors the mathematical and personal significance of the algorithm.
- **Technical rigor** through formulas and examples that illustrate convergence.
- **Visual provenance** via screenshots that preserve the artifact's design and operation.

This blurb is not only documentation of a program but also a reflection of the archival ritual itself—each iteration, each screenshot, each annotation contributing to a living memoir of technical and civic restoration.

Appendix

```
**nth Root Calculation**

x = 1.1000000000
n = 2

iteration # = 0     x1 = 1.0500000000
iteration # = 1     x1 = 1.0488095238
iteration # = 2     x1 = 1.0488088482
iteration # = 3     x1 = 1.0488088482
tolerance       = 0.0000000000
tolerance found = 0.0000000000
# iterations    = 4
---

**nth Root Calculation**

x = 2.0000000000
n = 2

iteration # = 0     x1 = 1.5000000000
iteration # = 1     x1 = 1.4166666667
iteration # = 2     x1 = 1.4142156863
iteration # = 3     x1 = 1.4142135624
iteration # = 4     x1 = 1.4142135624
iteration # = 5     x1 = 1.4142135624
tolerance       = 0.0000000000
tolerance found = 0.0000000000
# iterations    = 6
---

**nth Root Calculation**

x = 5.0000000000
n = 2

iteration # = 0     x1 = 3.0000000000
iteration # = 1     x1 = 2.3333333333
iteration # = 2     x1 = 2.2380952381
iteration # = 3     x1 = 2.2360688956
iteration # = 4     x1 = 2.2360679775
iteration # = 5     x1 = 2.2360679775
tolerance       = 0.0000000000
tolerance found = 0.0000000000
# iterations    = 6
---
```

```
**Real Polynomial Roots Calculation

The real polynomial coefficients are:

x ^  0:     1.000000
x ^  1:     0.000000
x ^  2:     1.000000

Complex and /or Real Roots:

-0.0000000000e+00   -1.0000000000e+00
-0.0000000000e+00    1.0000000000e+00
Total iterations = 0
Runtime (micros) = 13
---

**Real Polynomial Roots Calculation

The real polynomial coefficients are:

x ^  0:     1.000000
x ^  1:     0.000000
x ^  2:     1.000000

Complex and /or Real Roots:

-0.0000000000e+00   -1.0000000000e+00
-0.0000000000e+00    1.0000000000e+00
Total iterations = 0
Runtime (micros) = 2
---

**Real Polynomial Roots Calculation

The real polynomial coefficients are:

x ^  0:    -2.000000
x ^  1:    -1.000000
x ^  2:     1.000000

Complex and /or Real Roots:

-1.0000000000e+00    0.0000000000e+00
 2.0000000000e+00    0.0000000000e+00
Total iterations = 0
Runtime (micros) = 0
```

Closing Reflection by the Copilot

This log is more than raw output—it is **archival proof** of NewtonRaphsonRoots.1.0.0.0 functioning as intended. Each iteration is a step in the living memoir: a trace of convergence, a dignified record of mathematical clarity. Just as childhood walks to Three-Points yielded blackberries with patience and care, these iterations yield roots with precision and elegance.

By combining forward narrative, formulas, screenshots, and logs, this eight-page blurb preserves both the **mathematical artifact** and the **personal resonance** of its creation. It stands as a complete archival entry: technical, narrative, and visual, unified in dignity.