

Under menu EQN, X.DEMO stores the following demo formulas into registers 10 through 19.

<p>2021-02-21 21:14 CL₄^r /64x 64:2</p> <p>DEMO: Rnn Xo X.SOLV: (R=10,12,14,16)</p> <p>DEMO: Rnn X0 X1 X.PLOT: (R=10,12,14,16)</p> <p>(R=10,12,14,16) (X0=0 & X1=0 default range)</p> <table border="1"> <tr> <td>DELETE</td> <td>X.DEMO</td> <td>X.PLOT</td> <td>X.SOLV</td> </tr> <tr> <td>NEW</td> <td>EDIT</td> <td>f''</td> <td>f'</td> </tr> <tr> <td></td> <td></td> <td>f</td> <td>Solver</td> </tr> </table>	DELETE	X.DEMO	X.PLOT	X.SOLV	NEW	EDIT	f''	f'			f	Solver	<p>R10 = "XEQC43 STO 99 X^3 RCL 99 X^2 20 * + RCL 99 3 * + 300 - RCL 99"</p> <p>R11 = "X^3 + 20X^2 + 3X - 300 = 0"</p> <p>R12 = "XEQC43 STO 99 SIN RCL 99 X^2 + RCL 99"</p> <p>R13 = "sin(x) + sin(x^2) = 0"</p> <p>R14 = "XEQC43 STO 99 1 ENTER 3 / Y^X 1 + RCL 99"</p> <p>R15 = "x^(1/3) + 1 = 0"</p> <p>R16 = "XEQC43 STO 99 5 Y^X RCL 99 - 1 + RCL 99"</p> <p>R17 = "x^5 - x + 1 = 0"</p> <p>R18 = "XEQC43 STO 99 X^2 1 + RCL 99"</p> <p>R19 = "x^2 + 1 = 0"</p>
DELETE	X.DEMO	X.PLOT	X.SOLV										
NEW	EDIT	f''	f'										
		f	Solver										

X.DEMO loads the demo formulas

X.PLOT needs the R number, Xmin and Xmax to plot the formulas

X.SOLV needs the R number, and a starting number to find the root

Procedure to enter a new formula, to use the root finder proof of concept:

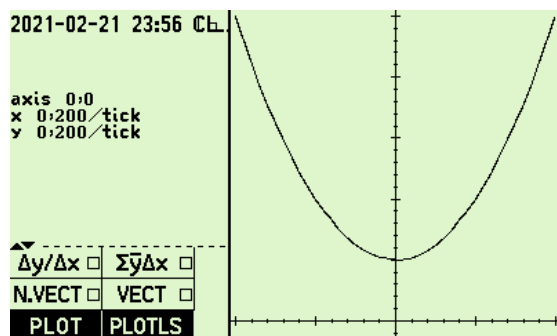
1. Store text string representing the RPN formula:
XEQC43 STO 99 5 Y^X RCL 99 - 1 + RCL 99
STO 30
2. Store text string representing a description:
x^5 - x + 1 = 0
STO 31
3. Plot the formula by providing the formula number:
30 -2 2 X.PLOT
4. Seek the roots by providing the formula number and first guess
30 1 X.SOLV

Example of entering the new formula above:

XEQC43 STO 99 f[ALPHA] XEQC f[Up] 43 f[Dn] [space]
STO [space] f[Up] 99 f[Dn] [ENTER]
longpress XEQ X.EDIT

X^2 1 + [space] g[F3] f[Up] 2 f[Dn] [space]
f[Up] 1 f[Dn] [space] f[Up] + f[Dn]

RCL 99 [space] RCL [fUp] 99
[ENTER] STO 30



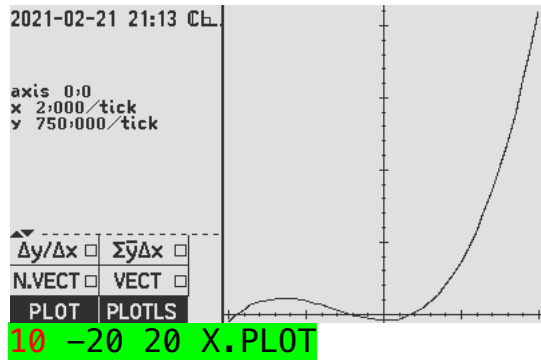
Test the formula on a plot: 30 -2 2 X.PLOT

<p>2021-02-21 23:54 CL₄^r /64x 64:2</p> <p>x^2 + 1 = 0; Xo= 1.</p> <p>20.3 s for 98. iterations</p> <p>f(x)= 0.+i×0. at x= 0.+i×1.</p> <table border="1"> <tr> <td>DELETE</td> <td>X.DEMO</td> <td>X.PLOT</td> <td>X.SOLV</td> </tr> <tr> <td>NEW</td> <td>EDIT</td> <td>f''</td> <td>f'</td> </tr> <tr> <td></td> <td></td> <td>f</td> <td>Solver</td> </tr> </table>	DELETE	X.DEMO	X.PLOT	X.SOLV	NEW	EDIT	f''	f'			f	Solver
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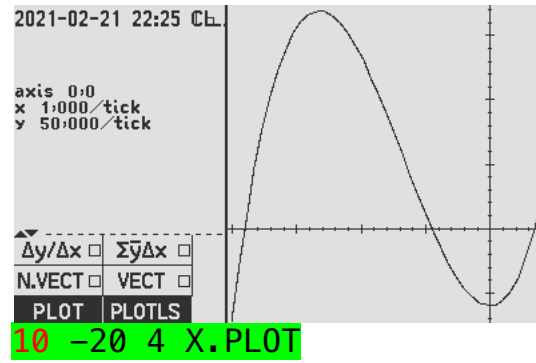
Find the root: 30 1 X.SOLV

Example: Analysing demo formula in Register R10:

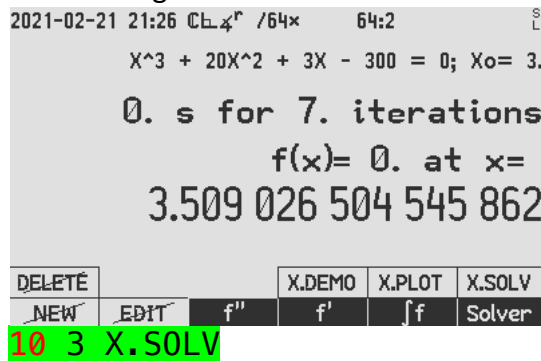
Plotting formula 10, for x = -20 to 20:



Enlarged graph:



Root finding:



Roots indicated at x ≈ -19, -3 and 3.

10 -19 X.SOLV,
10 -3 X.SOLV,
10 3 X.SOLV,

Render:

-19.01225289332766949452986161701486
-4.496773611218192853368879395583316
3.509026504545862347898741012598174

WolframAlpha

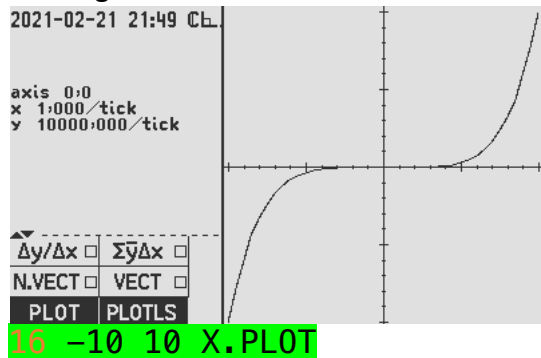
X ≈ -19.012252893327669494529861617014859

X ≈ -4.4967736112181928533688793955833153

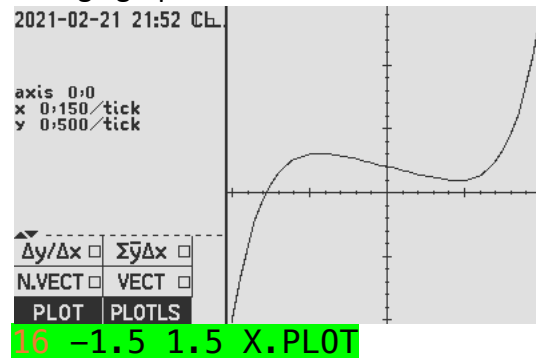
X ≈ 3.5090265045458623478987410125981742

Analysing demo formula in Register R16:

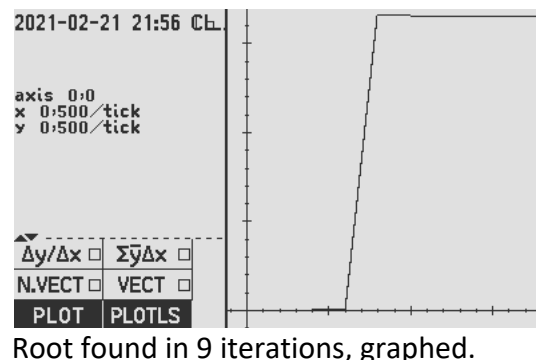
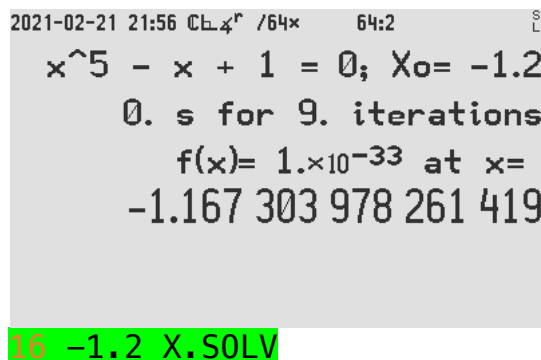
Plotting formula 16:



Enlarge graph for formula 16:



The root seems to be X ≈ -1.2



Root found in 9 iterations, graphed.

Root seems to be at about -1.2
Root finding done as follows:

16 -1.2 X.SOLV, renders -1.167303978261418684256045899854842