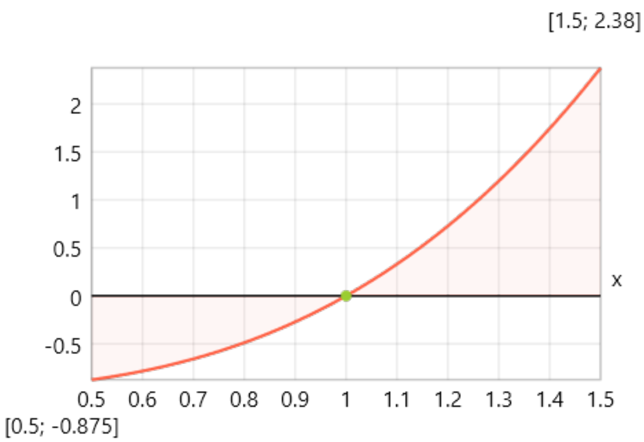
Root-finding Test Functions

Sérgio Galdino. *A family of regula falsi root-finding methods*. Proceedings of 2011 World Congress on Engineering and Technology. Shanghai, China. IEEE Press. ISBN 978-1-61284-365-0. p. 514-517

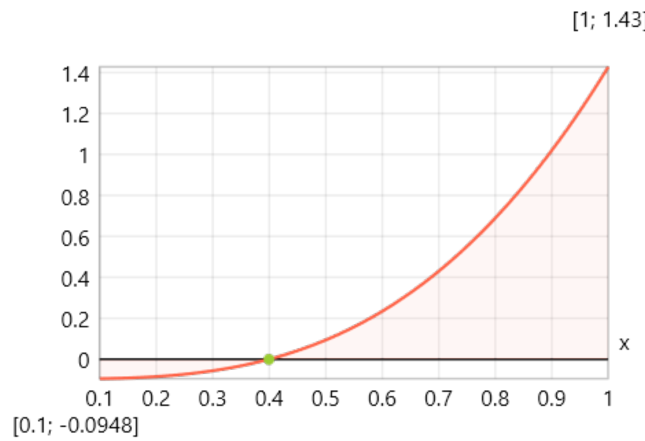
http://sergiogaldino.pbworks.com/w/file/fetch/66011429/0130-1943543

$$f_{01}(x) = x^3 - 1$$



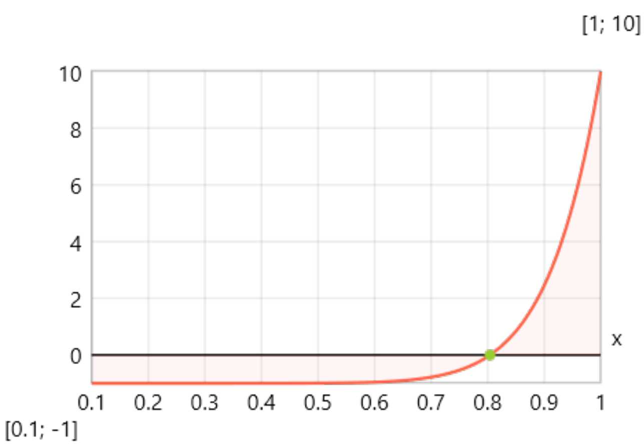
$$x_{01} = \$\mathrm{Root}\left\{f_{01}(x) = 0\,;\; x \in [0.5\,;\; 1.5]\right\} = 1$$

$$f_{02}(x) = x^2 \cdot \left(\frac{x^2}{3} + \sqrt{2} \cdot \sin(x)\right) - \frac{\sqrt{3}}{18}$$



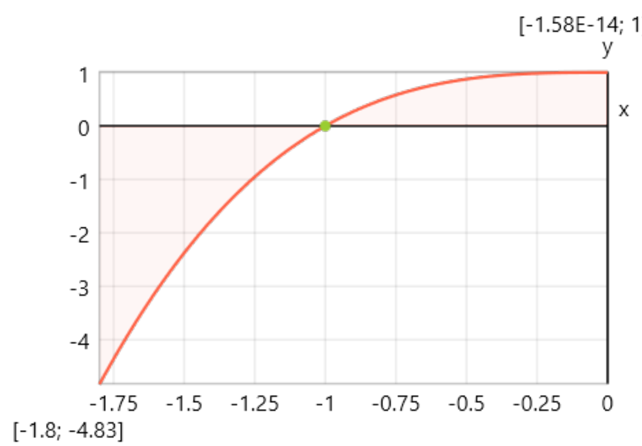
$$x_{02} = \$\mathrm{Root}\left\{f_{02}(x) = 0\,;\; x \in [0.1\,;\; 1]\right\} = 0.399$$

$$f_{03}(x) = 11 \cdot x^{11} - 1$$



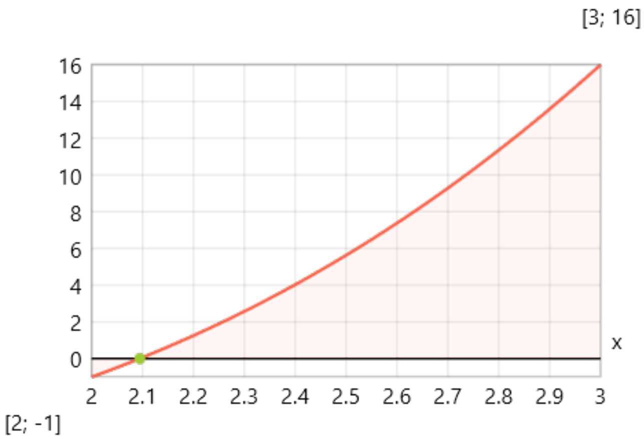
$$x_{03} = \$\mathrm{Root}\left\{f_{03}(x) = 0\,;\; x \in [0.1\,;\; 1]\right\} = 0.804$$

$$f_{04}(x) = x^3 + 1$$



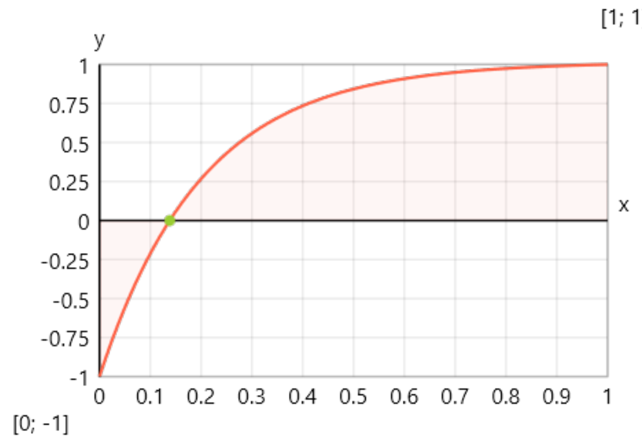
$$x_{04} = \$\mathrm{Root}\left\{f_{04}(x) = 0\,;\; x \in [-1.8\,;\; 0]\right\} = -1$$

$$f_{05}(x)=x^3-2\cdot x-5$$



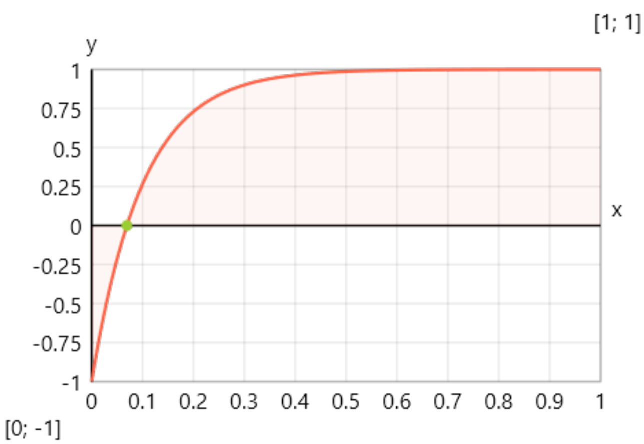
$$x_{05}=\$\mathrm{Root}\left\{f_{05}(x)=0;\ x\in[2;\ 3]\right\}=2.09$$

$$f_{06}(x)=2\cdot x\cdot e^{-5}+1-2\cdot e^{-5\cdot x}$$



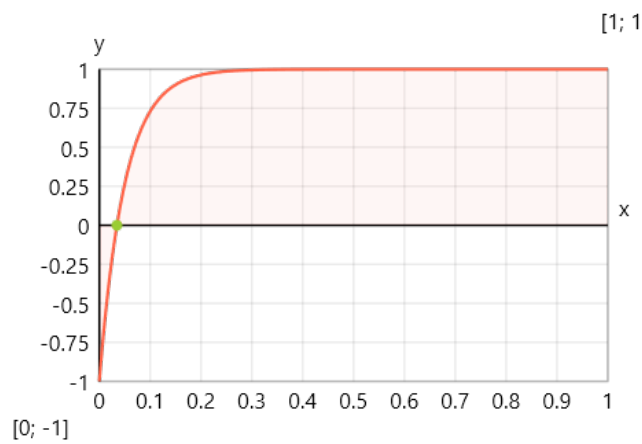
$$x_{06}=\$\mathrm{Root}\left\{f_{06}(x)=0;\ x\in[0;1]\right\}=0.138$$

$$f_{07}(x)=2\cdot x\cdot e^{-10}+1-2\cdot e^{-10\cdot x}$$



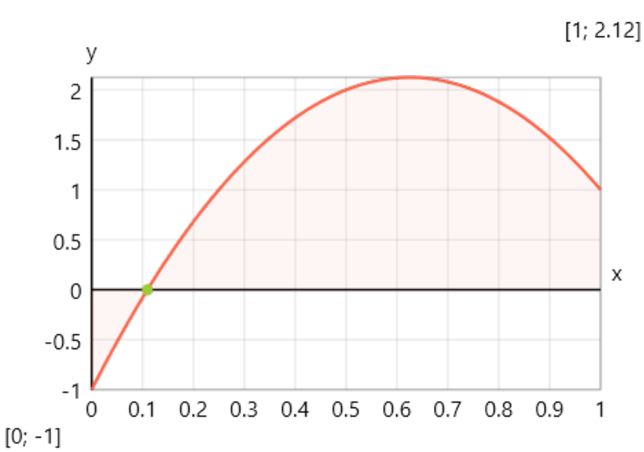
$$x_{07}=\$\mathrm{Root}\left\{f_{07}(x)=0;\ x\in[0;\ 1]\right\}=0.0693$$

$$f_{08}(x)=2\cdot x\cdot e^{-20}+1-2\cdot e^{-20\cdot x}$$



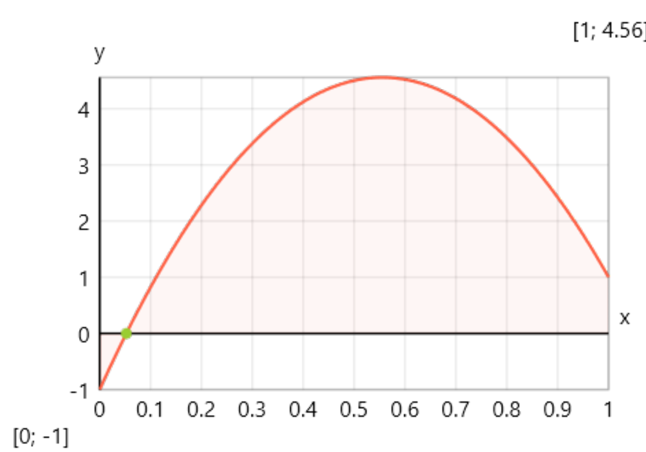
$$x_{08}=\$\mathrm{Root}\left\{f_{08}(x)=0;\ x\in[0;\ 1]\right\}=0.0347$$

$$f_{09}(x)=\left(1+(1-5)^2\right)\cdot x^2-(1-5\cdot x)^2$$



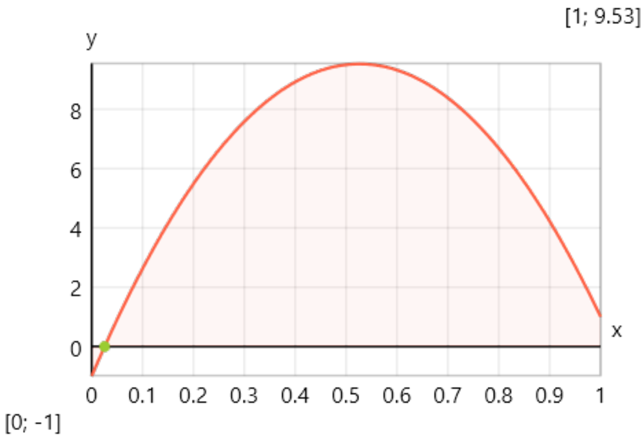
$$x_{09}=\$\mathrm{Root}\left\{f_{09}(x)=0;\ x\in[0;\ 1]\right\}=0.11$$

$$f_{10}(x)=\left(1+(1-10)^2\right)\cdot x^2-(1-10\cdot x)^2$$



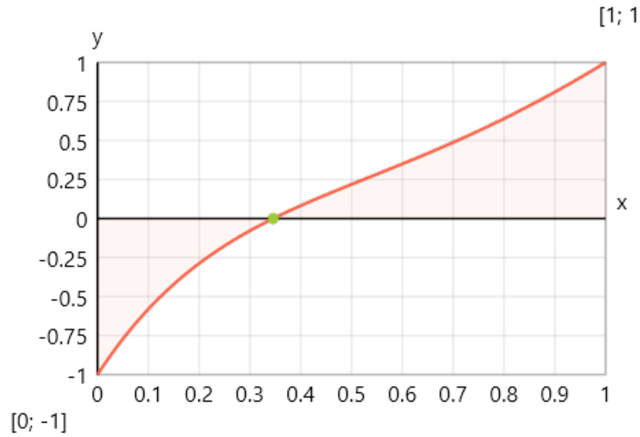
$$x_{10}=\$\mathrm{Root}\left\{f_{10}(x)=0;\ x\in[0;\ 1]\right\}=0.0525$$

$$f_{11}(x)=\left(1+(1-20)^2\right)\cdot x^2-(1-20\cdot x)^2$$



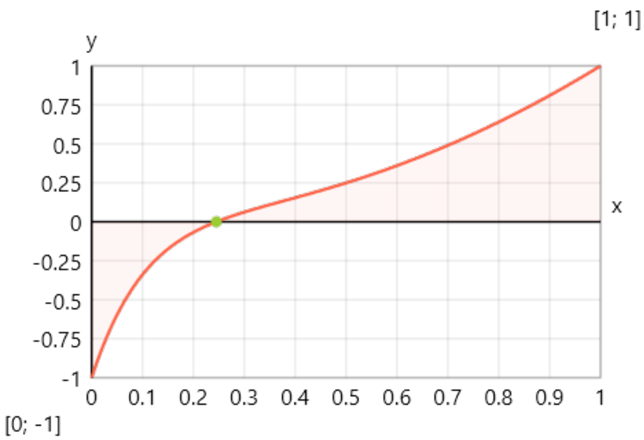
$$x_{11}=\text{\$Root}\left\{f_{11}(x)=0\,;\ x\in[0\,;\ 1]\right\}=0.0256$$

$$f_{12}(x)=x^2-(1-x)^5$$



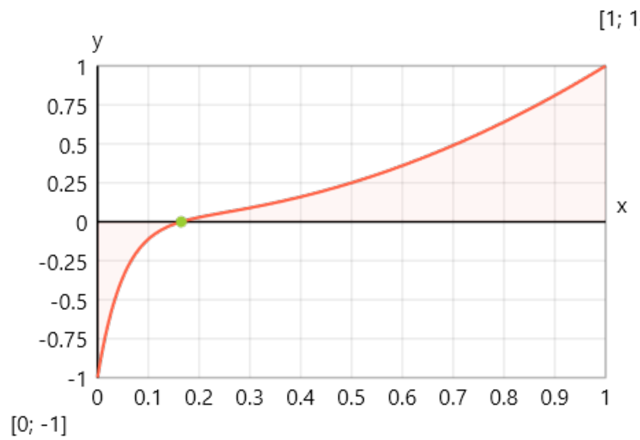
$$x_{12}=\text{\$Root}\left\{f_{12}(x)=0\,;\ x\in[0\,;\ 1]\right\}=0.346$$

$$f_{13}(x)=x^2-(1-x)^{10}$$



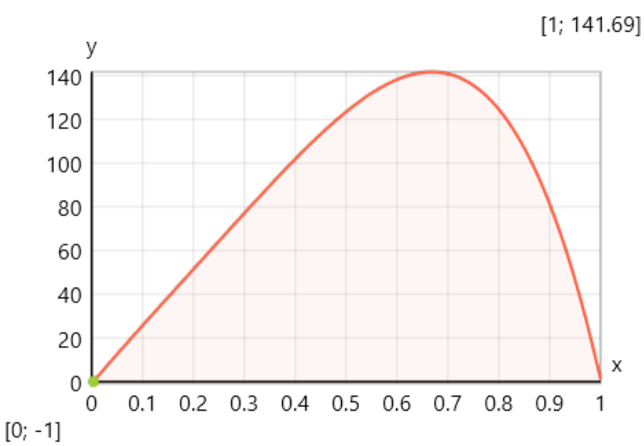
$$x_{13}=\text{\$Root}\left\{f_{13}(x)=0\,;\ x\in[0\,;\ 1]\right\}=0.245$$

$$f_{14}(x)=x^2-(1-x)^{20}$$



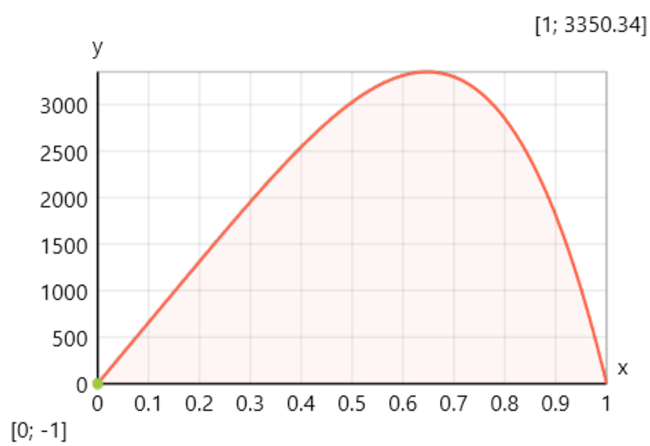
$$x_{14}=\text{\$Root}\left\{f_{14}(x)=0\,;\ x\in[0\,;\ 1]\right\}=0.165$$

$$f_{15}(x)=\left(1+(1-5)^4\right)\cdot x-(1-5\cdot x)^4$$



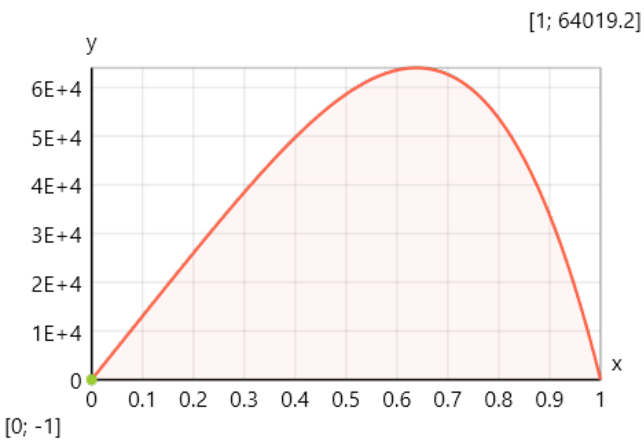
$$x_{15}=\text{\$Root}\left\{f_{15}(x)=0\,;\ x\in[0\,;\ 1]\right\}=0.00362$$

$$f_{16}(x)=\left(1+(1-10)^4\right)\cdot x-(1-10\cdot x)^4$$



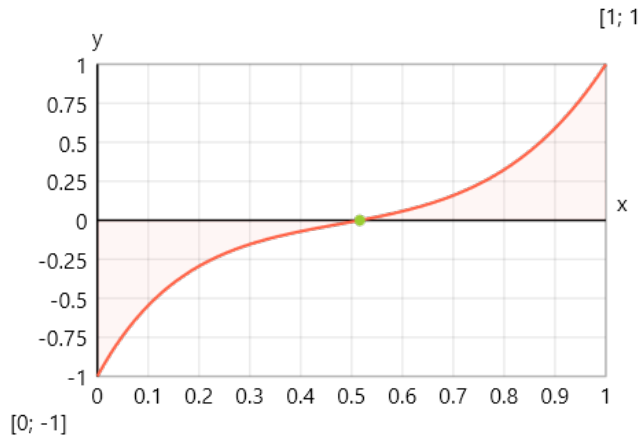
$$x_{16}=\text{\$Root}\left\{f_{16}(x)=0\,;\ x\in[0\,;\ 1]\right\}=0.000151$$

$$f_{17}(x)=\left(1+(1-20)^4\right)\cdot x-(1-20\cdot x)^4$$



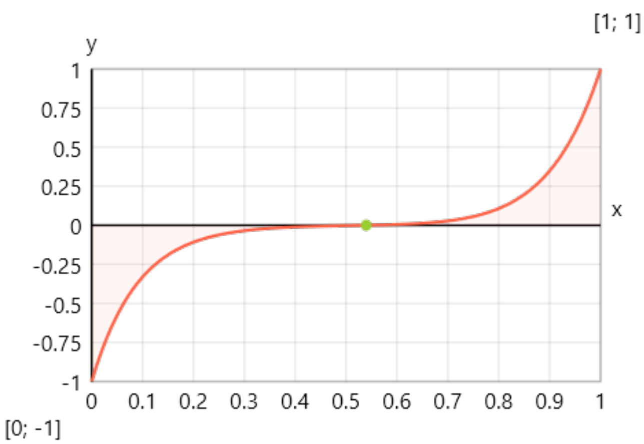
$$x_{17}=\$\mathrm{Root}\left\{f_{17}(x)=0;\ x\in[0;\ 1]\right\}=7.67\times10^{-6}$$

$$f_{18}(x)=e^{-5\cdot x}\cdot(x-1)+x^5$$



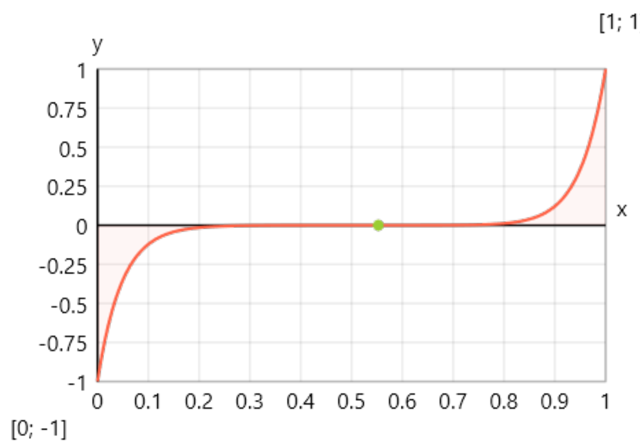
$$x_{18}=\$\mathrm{Root}\left\{f_{18}(x)=0;\ x\in[0;\ 1]\right\}=0.516$$

$$f_{19}(x)=e^{-10\cdot x}\cdot(x-1)+x^{10}$$



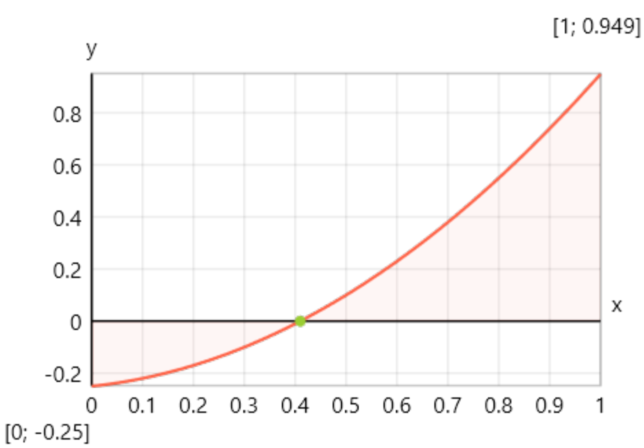
$$x_{19}=\$\mathrm{Root}\left\{f_{19}(x)=0;\ x\in[0;\ 1]\right\}=0.54$$

$$f_{20}(x)=e^{-20\cdot x}\cdot(x-1)+x^{20}$$



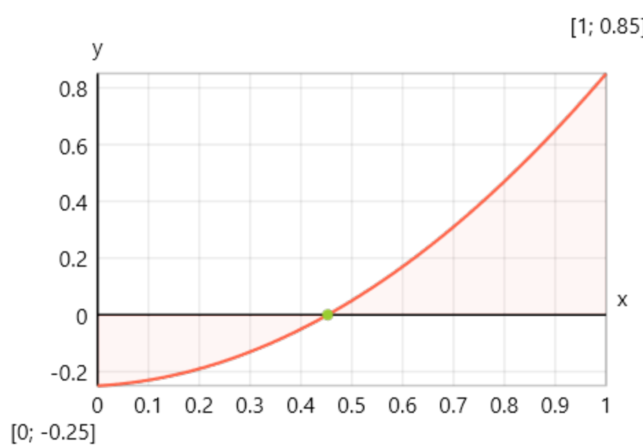
$$x_{20}=\$\mathrm{Root}\left\{f_{20}(x)=0;\ x\in[0;\ 1]\right\}=0.553$$

$$f_{21}(x)=x^2+\sin\left(\frac{x}{5}\right)-\frac{1}{4}$$



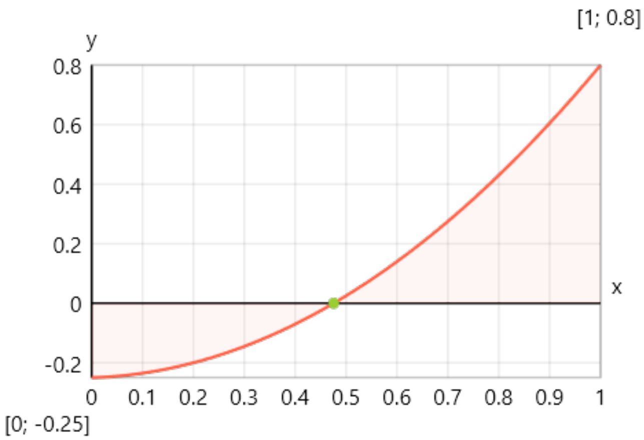
$$x_{21}=\$\mathrm{Root}\left\{f_{21}(x)=0;\ x\in[0;\ 1]\right\}=0.41$$

$$f_{22}(x)=x^2+\sin\left(\frac{x}{10}\right)-\frac{1}{4}$$



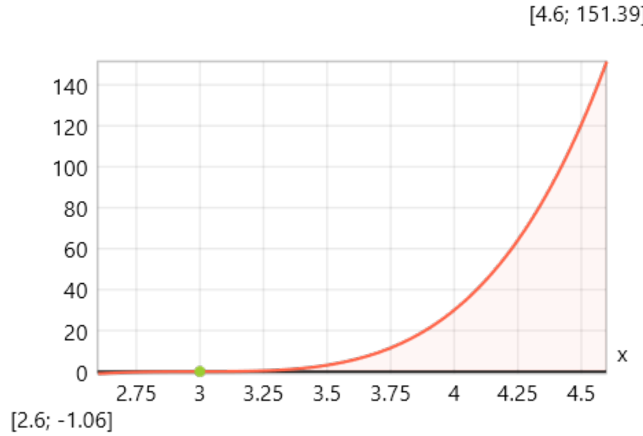
$$x_{22}=\$\mathrm{Root}\left\{f_{22}(x)=0;\ x\in[0;\ 1]\right\}=0.453$$

$$f_{23}(x)=x^2+\sin\left(\frac{x}{20}\right)-\frac{1}{4}$$



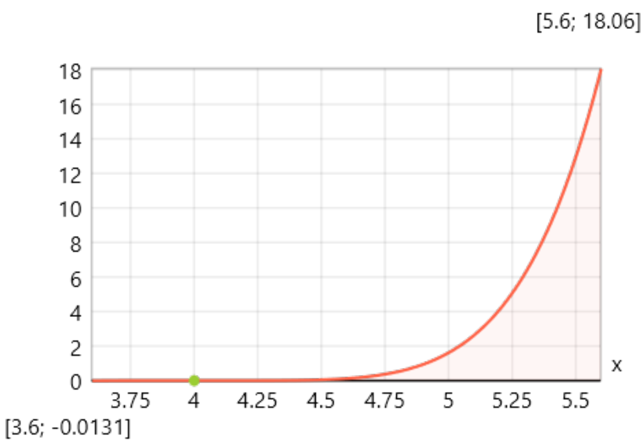
$$x_{23}=\$\text{Root}\left\{f_{23}(x)=0\,;\ x\in[0\,;\ 1]\right\}=0.476$$

$$f_{24}(x)=(x+2)\cdot(x+1)\cdot(x-3)^3$$



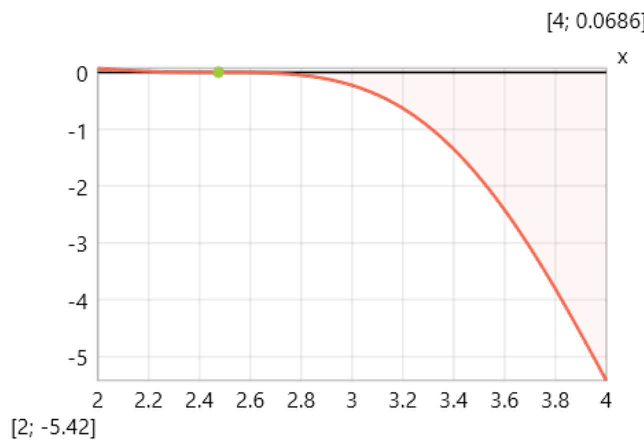
$$x_{24}=\$\text{Root}\left\{f_{24}(x)=0\,;\ x\in[2.6\,;\ 4.6]\right\}=3$$

$$f_{25}(x)=(x-4)^5\cdot\ln(x)$$



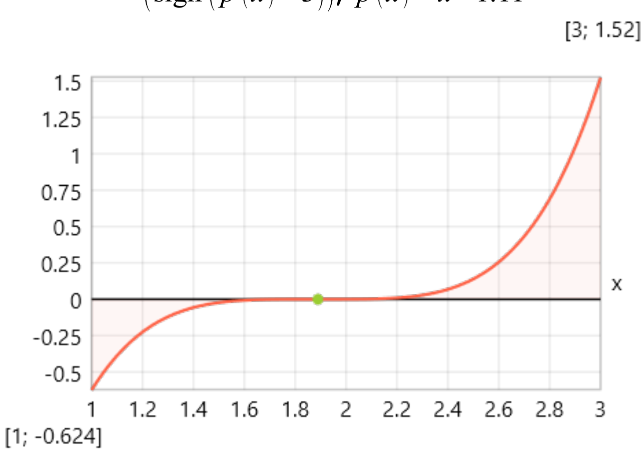
$$x_{25}=\$\text{Root}\left\{f_{25}(x)=0\,;\ x\in[3.6\,;\ 5.6]\right\}=4$$

$$f_{26}(x)=\left(\sin(x)-\frac{x}{4}\right)^3$$



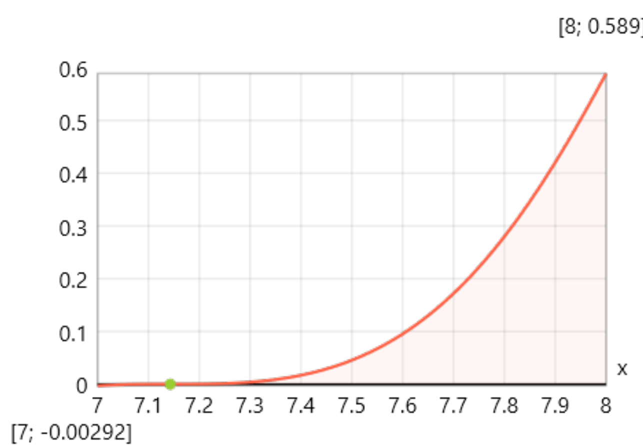
$$x_{26}=\$\text{Root}\left\{f_{26}(x)=0\,;\ x\in[2\,;\ 4]\right\}=2.47$$

$$f_{27}(x)=\left(81-p(x)\cdot\left(108-p(x)\cdot\left(54-p(x)\cdot\left(12-p(x)\right)\right)\right)\right.$$
$$\left.\cdot\left(\text{sign}\left(p(x)-3\right)\right)\right),\ p(x)=x+1.11$$



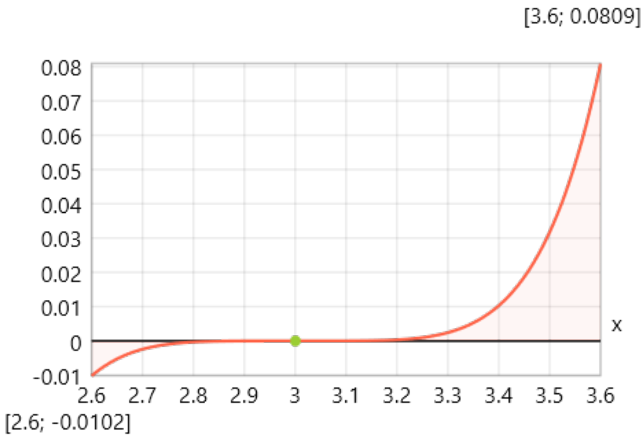
$$x_{27}=\$\text{Root}\left\{f_{27}(x)=0\,;\ x\in[1\,;\ 3]\right\}=1.89$$

$$f_{28}(x)=\sin\left((x-7.14)^3\right)$$



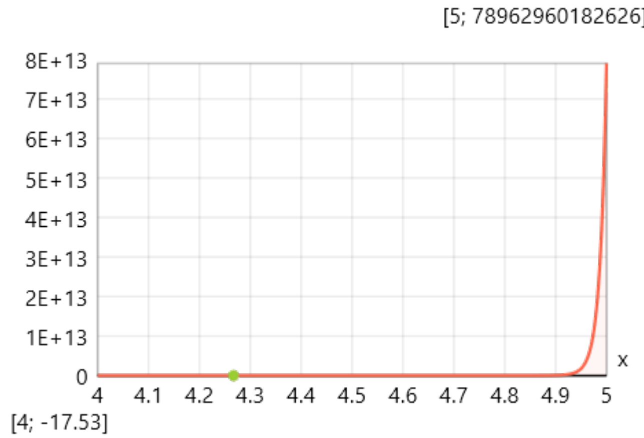
$$x_{28}=\$\text{Root}\left\{f_{28}(x)=0\,;\ x\in[7\,;\ 8]\right\}=7.14$$

$$f_{29}(x)=e^{(x-3)^5}-1$$



$$x_{29}=\$\text{Root}\{f_{29}(x)=0;\ x\in[2.6;\ 3.6]\}=3$$

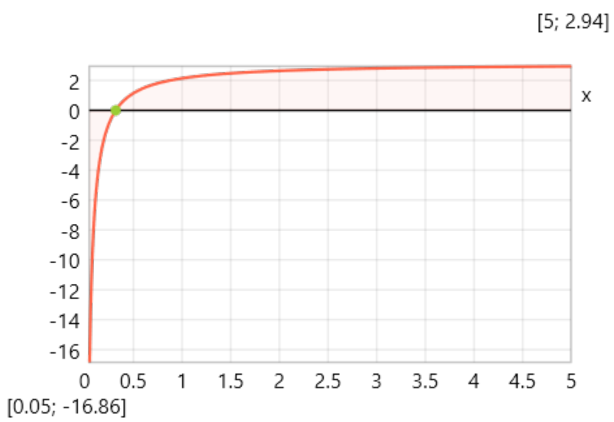
$$f_{30}(x)=e^{(x-3)^5}-e^{x-1}$$



$$x_{30}=\$\text{Root}\{f_{30}(x)=0;\ x\in[4;\ 5]\}=4.27$$

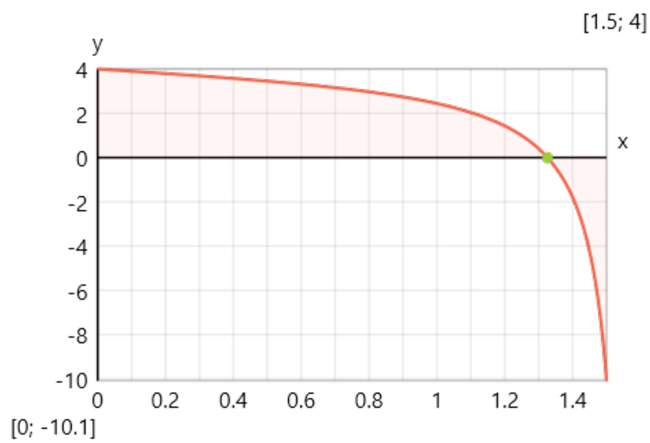
My functions

$$f_{31}(x)=\pi-\frac{1}{x}$$



$$x_{31}=\$\text{Root}\{f_{31}(x)=0;\ x\in[0.05\ v\ 5]\}=0.318$$

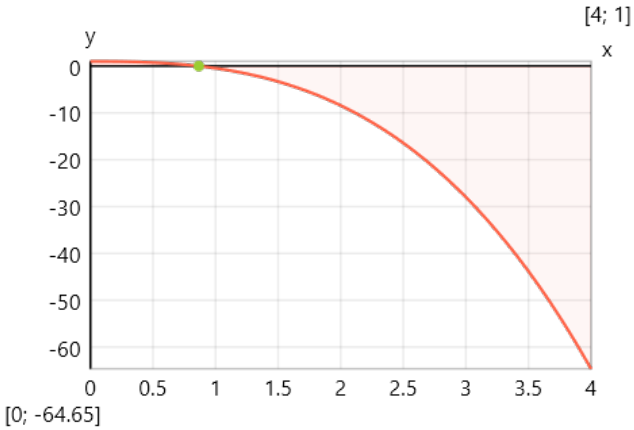
$$f_{32}(x)=4-\tan(x)$$



$$x_{32}=\$\text{Root}\{f_{32}(x)=0;\ x\in[0;\ 1.5]\}=1.33$$

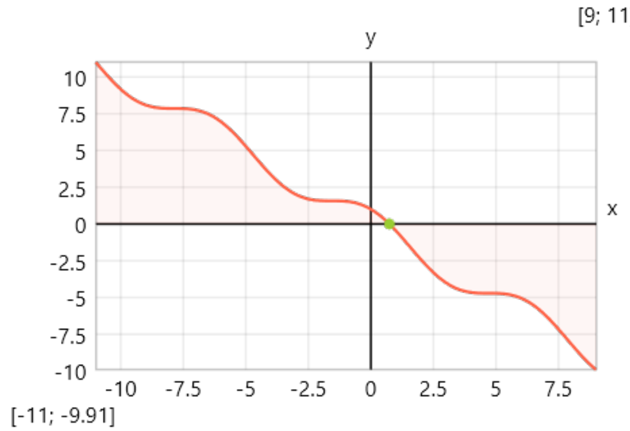
Steven A. Stage. *Comments on An Improvement to the Brent's Method*. International Journal of Experimental Algorithms (IJEA), Volume (4) : Issue (1) : 2013

$$f_{33}(x)=\cos(x)-x^3$$



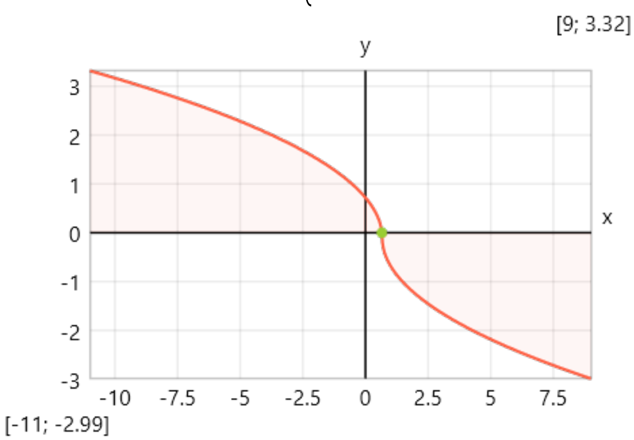
$$x_{33}=\$\text{Root}\left\{f_{33}(x)=0;\ x\in[0;\ 4]\right\}=0.865$$

$$f_{34}(x)=\cos(x)-x$$



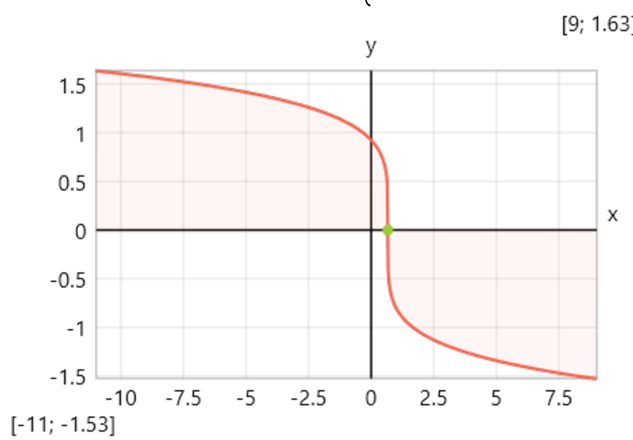
$$x_{34}=\$\text{Root}\left\{f_{34}(x)=0;\ x\in[\text{-}11;\ 9]\right\}=0.739$$

$$f_{35}(x)=\sqrt{\left|x-\frac{2}{3}\right|}\cdot\begin{cases}\text{if } x\le\frac{2}{3}: & 1\\ \text{else:} & -1\end{cases}-0.1$$



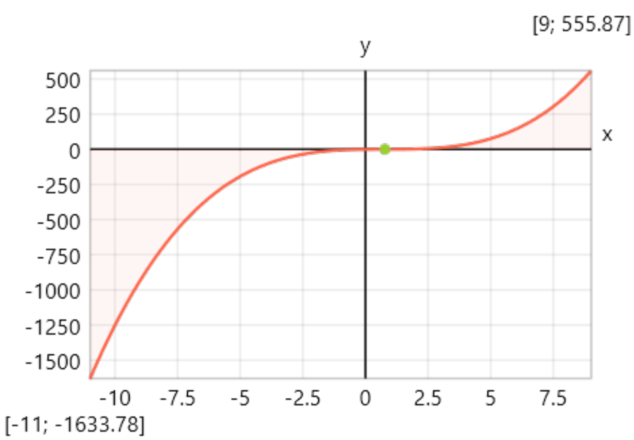
$$x_{35}=\$\text{Root}\left\{f_{35}(x)=0;\ x\in[\text{-}11;\ 9]\right\}=0.657$$

$$f_{36}(x)=\left(\left|x-\frac{2}{3}\right|\right)^{0.2}\cdot\begin{cases}\text{if } x\le\frac{2}{3}: & 1\\ \text{else:} & -1\end{cases}$$



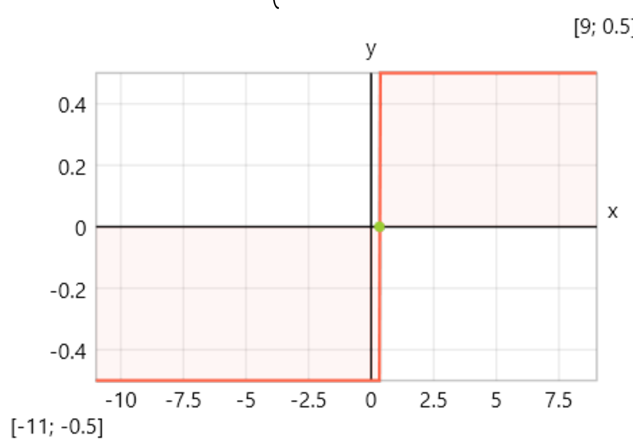
$$x_{36}=\$\text{Find}\left\{f_{36}(x);\ x\in[\text{-}11;\ 9]\right\}=0.667$$

$$f_{37}(x)=\left(x-\frac{7}{9}\right)^3+\left(x-\frac{7}{9}\right)\cdot 10^{-3}$$



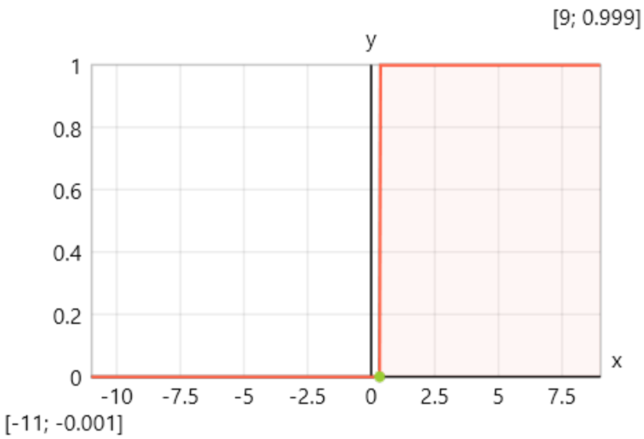
$$x_{37}=\$\text{Root}\left\{f_{37}(x)=0;\ x\in[\text{-}11;\ 9]\right\}=0.778$$

$$f_{38}(x)=\begin{cases}\text{if } x\le\frac{1}{3}: & -0.5\\ \text{else:} & 0.5\end{cases}$$



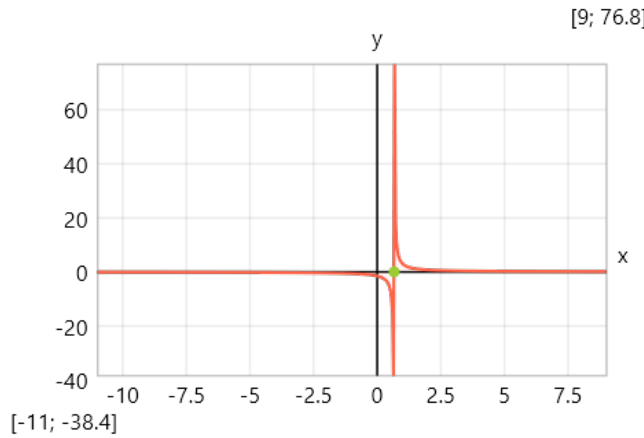
$$x_{38}=\$\text{Find}\left\{f_{38}(x);\ x\in[\text{-}11;\ 9]\right\}=0.333$$

$$f_{39}(x) = \begin{cases} \text{if } x \le \dfrac{1}{3}: & -\left(10^{-3}\right) \\ \text{else:} & 1 - 10^{-3} \end{cases}$$



$$x_{39} = \$\text{Find}\left\{f_{39}(x);\ x \in [-11; 9]\right\} = 0.333$$

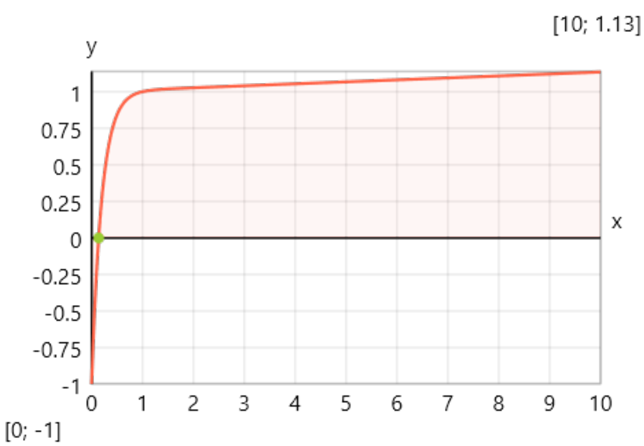
$$f_{40}(x) = \begin{cases} \text{if } x \equiv 0: & 0 \\ \text{else:} & \dfrac{1}{x - 2/3} \end{cases}$$



$$x_{40} = \$\text{Find}\left\{f_{40}(x);\ x \in [-11; 9]\right\} = 0.667$$

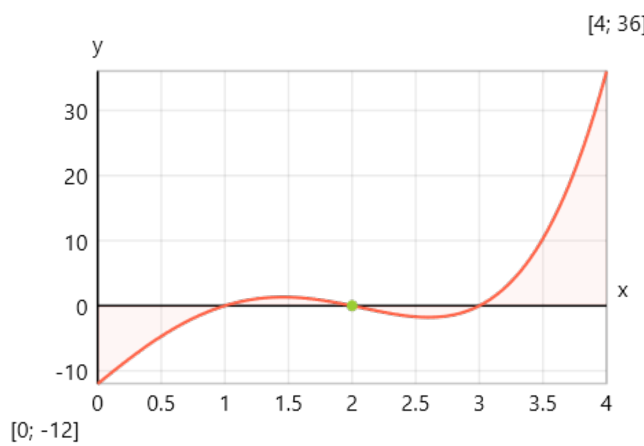
A. Swift, G. R. Lindfield, *Comparison of a continuation method with Brent's method for the numerical solution of a single nonlinear equation*, The Computer Journal, Volume 21, Issue 4, 1978, p. 359–362 https://doi.org/10.1093/comjnl/21.4.359

$$f_{41}(x) = 2 \cdot x \cdot e^{-5} - 2 \cdot e^{-5 \cdot x} + 1$$



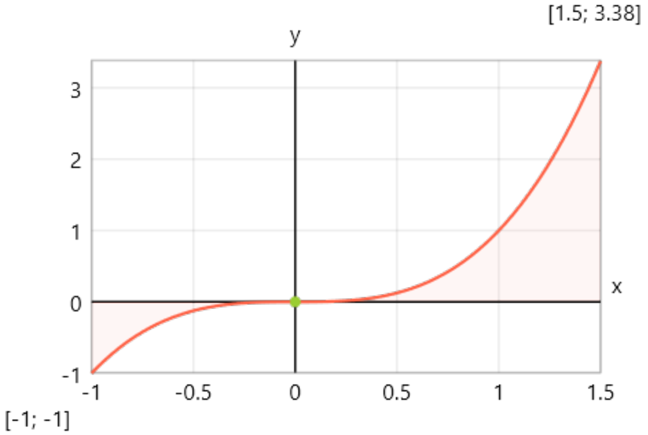
$$x_{41} = \$\text{Root}\left\{f_{41}(x) = 0;\ x \in [0;\ 10]\right\} = 0.138$$

$$f_{42}(x) = \left(x^2 - x - 6\right) \cdot \left(x^2 - 3 \cdot x + 2\right)$$



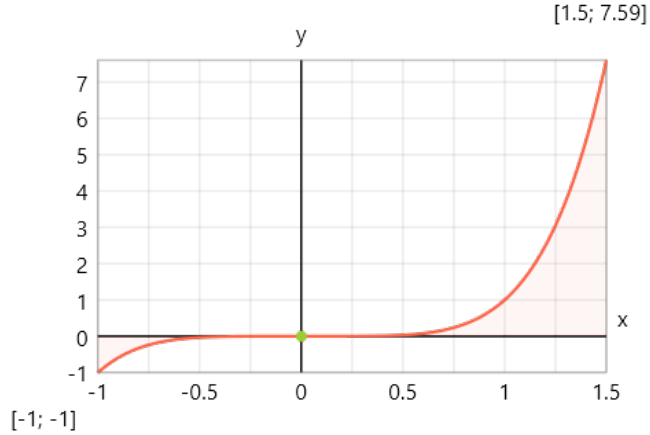
$$x_{42} = \$\text{Root}\left\{f_{42}(x) = 0;\ x \in [0;\ 4]\right\} = 2$$

$$f_{43}(x)=x^3$$



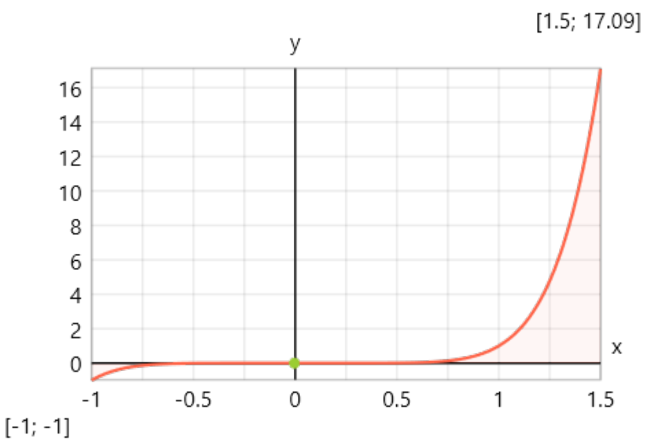
$$x_{43}=\$\mathrm{Root}\left\{f_{43}(x)=0\,;\ x\in[-1;\ 1.5]\right\}=-1.46\times10^{-11}$$

$$f_{44}(x)=x^5$$



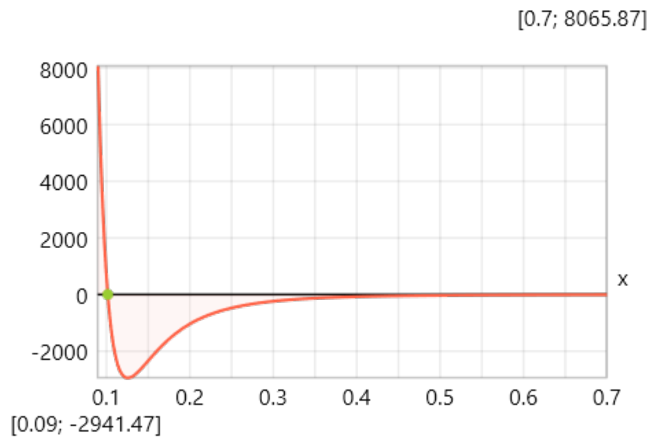
$$x_{44}=\$\mathrm{Root}\left\{f_{44}(x)=0\,;\ x\in[-1;\ 1.5]\right\}=2.38\times10^{-7}$$

$$f_{45}(x)=x^7$$



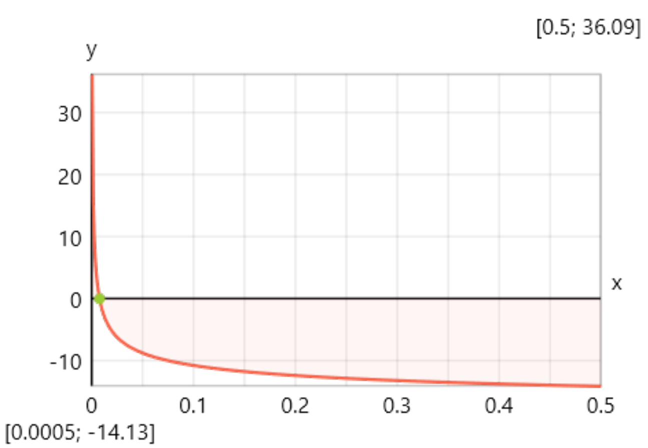
$$x_{45}=\$\mathrm{Root}\left\{f_{45}(x)=0\,;\ x\in[-1;\ 1.5]\right\}=-1.53\times10^{-5}$$

$$f_{46}(x)=\frac{e^{-5\cdot x}-x-0.5}{x^5}$$



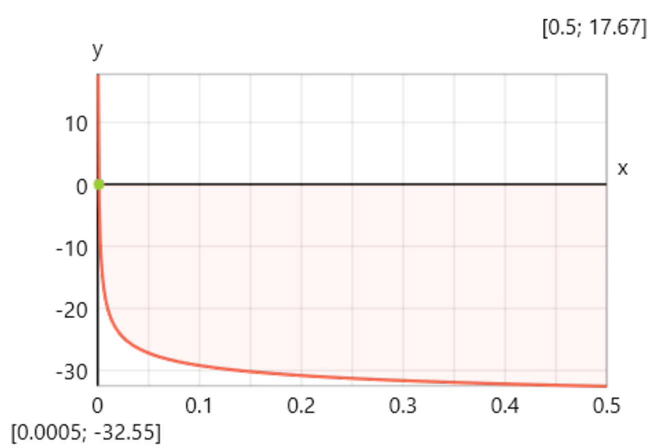
$$x_{46}=\$\mathrm{Root}\left\{f_{46}(x)=0\,;\ x\in[0.09\,;\ 0.7]\right\}=0.102$$

$$f_{47}(x)=\frac{1}{\sqrt{x}}-2\cdot\ln\left(5\cdot10^3\cdot\sqrt{x}\right)+0.8$$



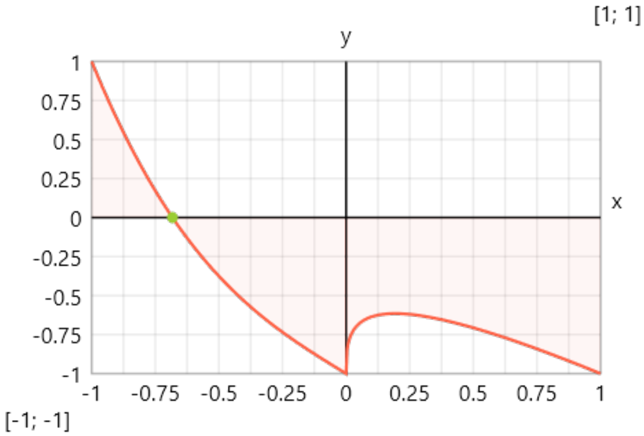
$$x_{47}=\$\mathrm{Root}\left\{f_{47}(x)=0\,;x\in[0.0005\,;0.5]\right\}=0.00773$$

$$f_{48}(x)=\frac{1}{\sqrt{x}}-2\cdot\ln\left(5\cdot10^7\cdot\sqrt{x}\right)+0.8$$



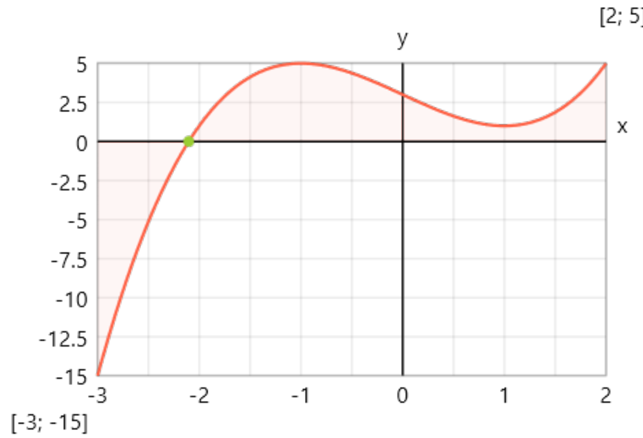
$$x_{48}=\$\mathrm{Root}\left\{f_{48}(x)=0\,;x\in[0.0005\,;0.5]\right\}=0.00128$$

$$f_{49}(x)=\begin{cases}\text{if } x\le 0: & -\left(x^3\right)-x-1\\ \text{else:} & x^{\frac{1}{3}}-x-1\end{cases}$$



$$x_{49}=\$\text{Root}\left\{f_{49}(x)=0;\ x\in[-1;\ 1]\right\}=-0.682$$

$$f_{50}(x)=x^3-2\cdot x-x+3$$

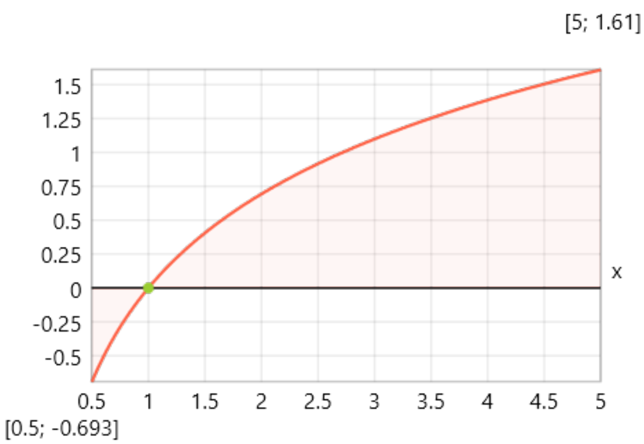


$$x_{50}=\$\text{Root}\left\{f_{50}(x)=0;\ x\in[-3;\ 2]\right\}=-2.1$$

Alojz Suhadolnik, Combined bracketing methods for solving nonlinear equations, Applied Mathematics Letters, Volume 25, Issue 11, 2012, Pages 1755-1760, ISSN 0893-9659

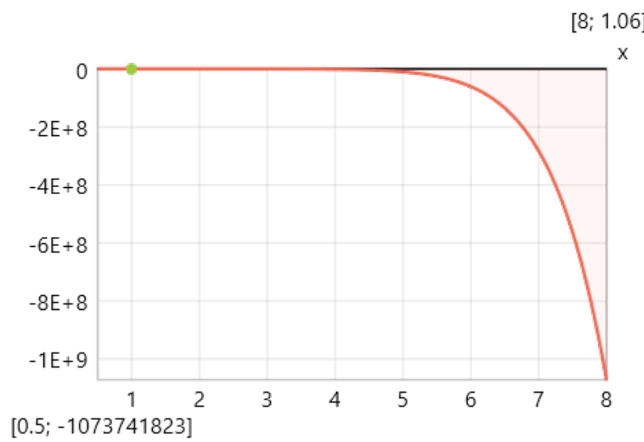
https://doi.org/10.1016/j.aml.2012.02.006

$$f_{51}(x)=\ln(x)$$



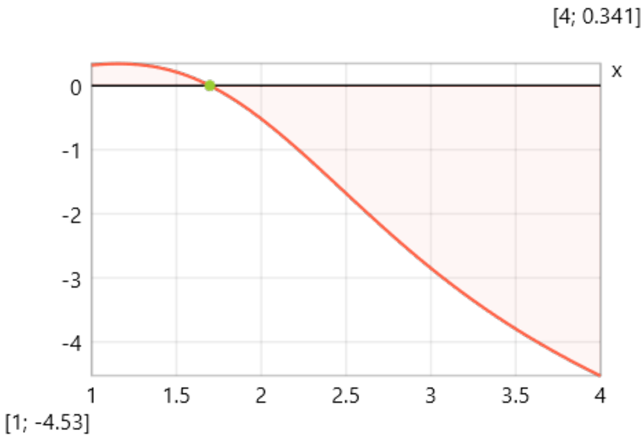
$$x_{51}=\$\text{Root}\left\{f_{51}(x)=0;\ x\in[0.5;\ 5]\right\}=1$$

$$f_{52}(x)=(10-x)\cdot e^{-10\cdot x}-x^{10}+1$$



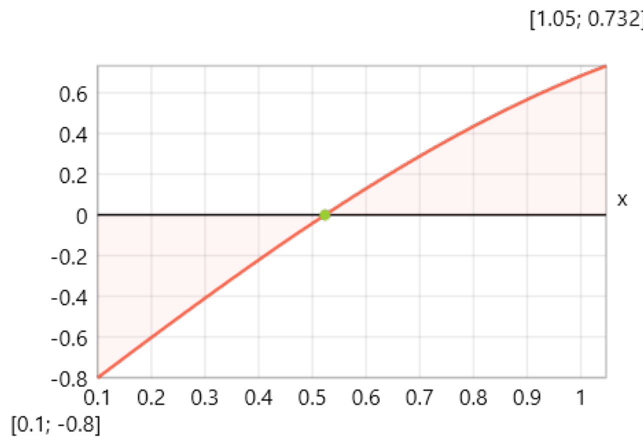
$$x_{52}=\$\text{Root}\left\{f_{52}(x)=0;\ x\in[0.5;\ 8]\right\}=1$$

$$f_{53}(x)=e^{\sin(x)}-x-1$$



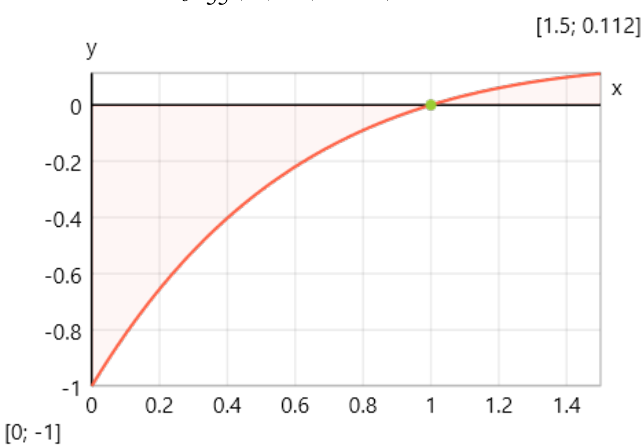
$$x_{53}=\text{\$Root}\left\{f_{53}(x)=0\,;\ x\in[1\,;\ 4]\right\}=1.7$$

$$f_{54}(x)=2\cdot\sin(x)-1$$



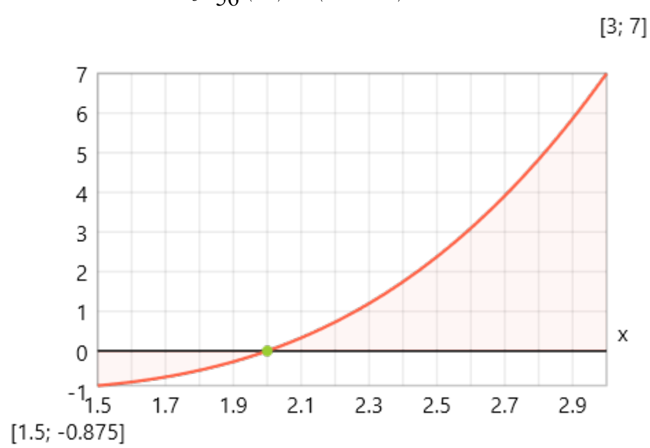
$$x_{54}=\text{\$Root}\left\{f_{54}(x)=0\,;\ x\in\left[0.1\,;\ \frac{\pi}{3}\right]\right\}=0.524$$

$$f_{55}(x)=(x-1)\cdot e^{-x}$$



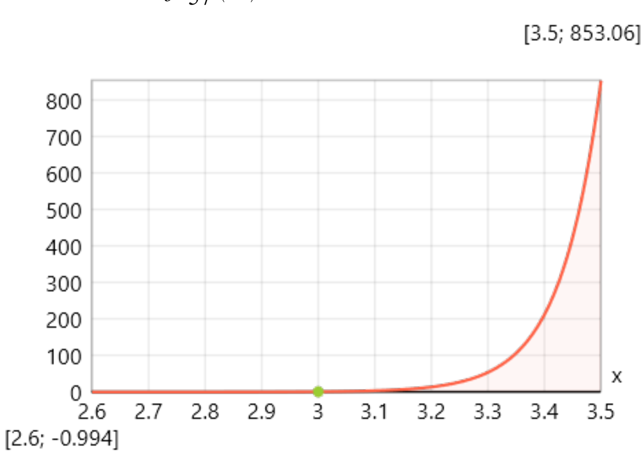
$$x_{55}=\text{\$Root}\left\{f_{55}(x)=0\,;\ x\in[0\,;\ 1.5]\right\}=1$$

$$f_{56}(x)=(x-1)^3-1$$



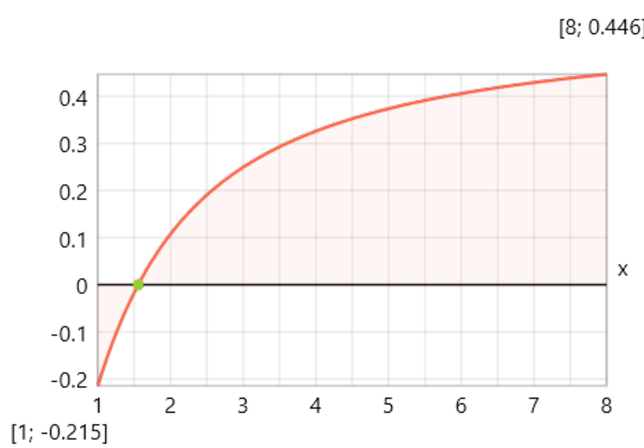
$$x_{56}=\text{\$Root}\left\{f_{56}(x)=0\,;\ x\in[1.5\,;\ 3]\right\}=2$$

$$f_{57}(x)=e^{x^2+7\cdot x-30}-1$$



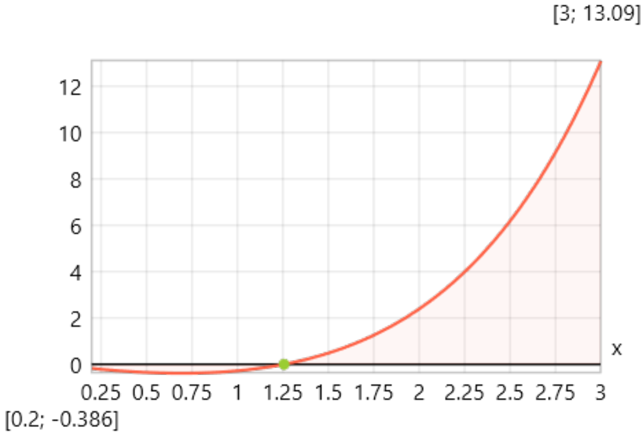
$$x_{57}=\text{\$Root}\left\{f_{57}(x)=0\,;\ x\in[2.6\,;3.5]\right\}=3$$

$$f_{58}(x)=\text{atan}(x)-1$$



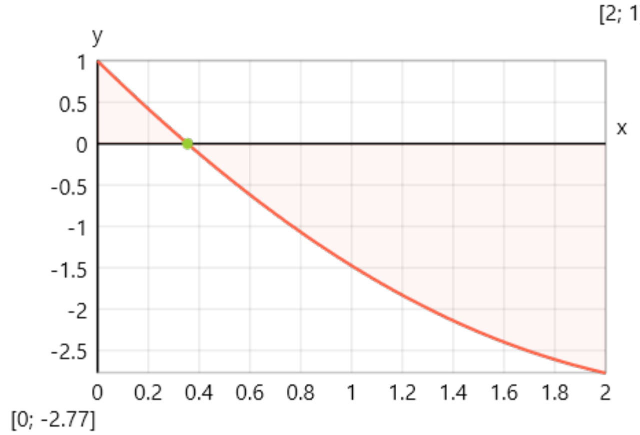
$$x_{58}=\text{\$Root}\left\{f_{58}(x)=0\,;\ x\in[1\,;8]\right\}=1.56$$

$$f_{59}(x) = e^x - 2 \cdot x - 1$$



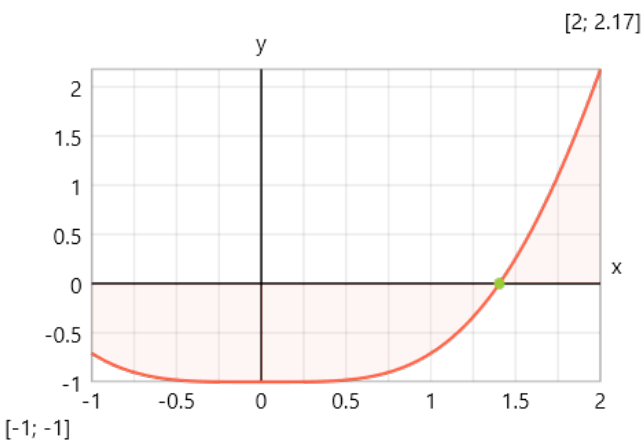
$$x_{59} = \$\text{Root}\{f_{59}(x) = 0;\ x \in [0.2;\ 3]\} = 1.26$$

$$f_{60}(x) = e^{-x} - x - \sin(x)$$



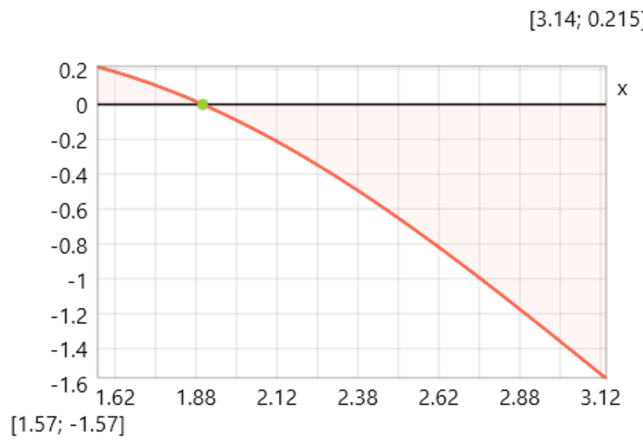
$$x_{60} = \$\text{Root}\{f_{60}(x) = 0;\ x \in [0;\ 2]\} = 0.354$$

$$f_{61}(x) = x^2 - \sin(x)^2 - 1$$



$$x_{61} = \$\text{Root}\{f_{61}(x) = 0;\ x \in [-1;\ 2]\} = 1.4$$

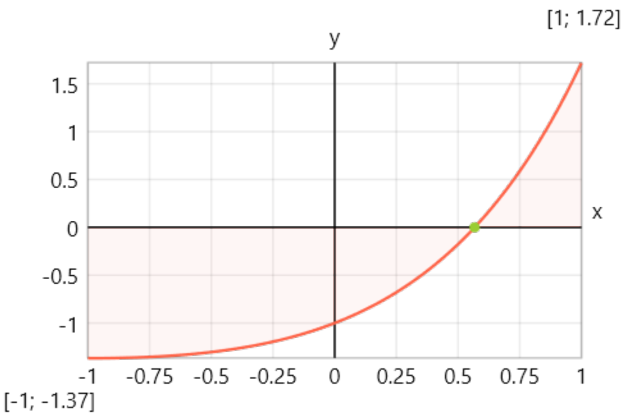
$$f_{62}(x) = \sin(x) - x/2$$



$$x_{62} = \$\text{Root}\{f_{62}(x) = 0;\ x \in [\pi/2;\ \pi]\} = 1.9$$

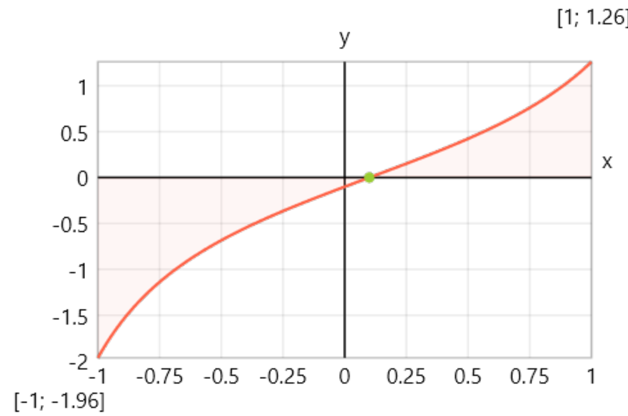
Oliveira I. F. D., Takahashi R. H. C. An Enhancement of the Bisection Method Average Performance Preserving Minmax Optimality

Lambert - $f_{63}(x)=x\cdot\exp(x)-1$



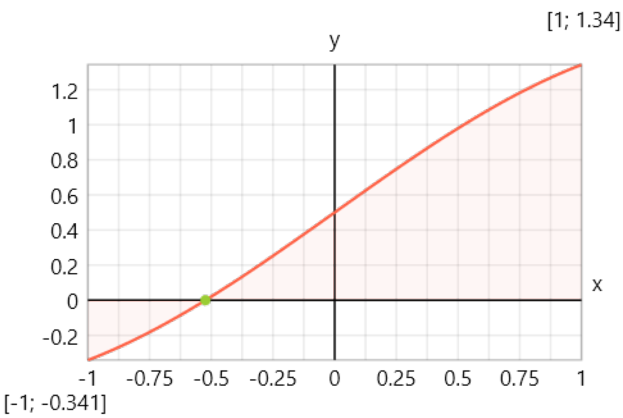
$$x_{63}=\$\text{Root}\left\{f_{63}(x)=0;\ x\in[-1;\ 1]\right\}=0.567$$

Trigonometric 1 - $f_{64}(x)=\tan\left(x-\frac{1}{10}\right)$



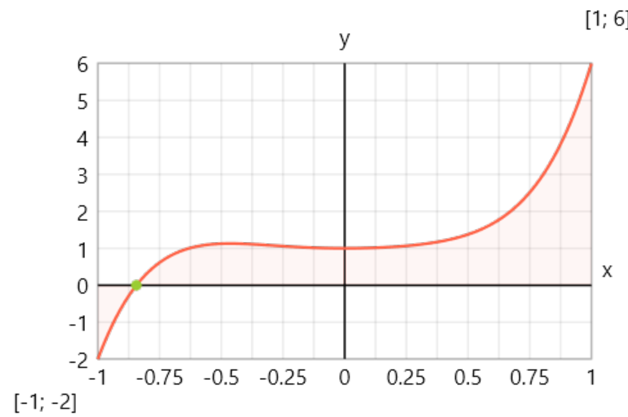
$$x_{64}=\$\text{Root}\left\{f_{64}(x)=0;\ x\in[-1;\ 1]\right\}=0.1$$

Trigonometric 2 - $f_{65}(x)=\sin(x)+0.5$



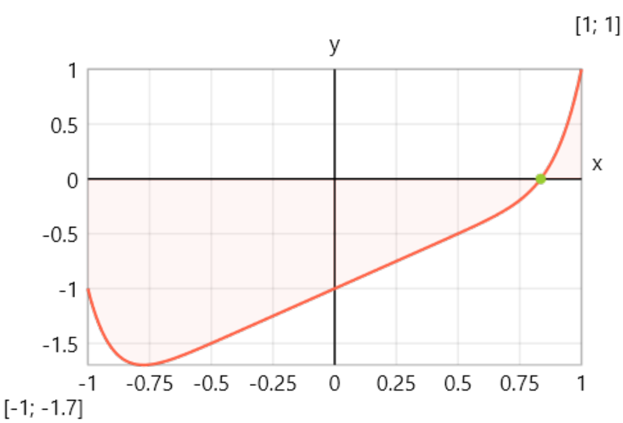
$$x_{65}=\$\text{Root}\left\{f_{65}(x)=0;\ x\in[-1;\ 1]\right\}=-0.524$$

Polynomial 1 - $f_{66}(x)=4\cdot x^5+x\cdot x+1$



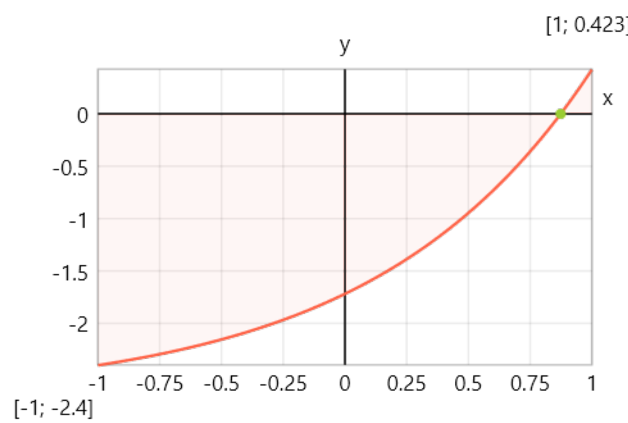
$$x_{66}=\$\text{Root}\left\{f_{66}(x)=0;\ x\in[-1;\ 1]\right\}=-0.844$$

Polynomial 2 - $f_{67}(x)=x+x^{10}-1$



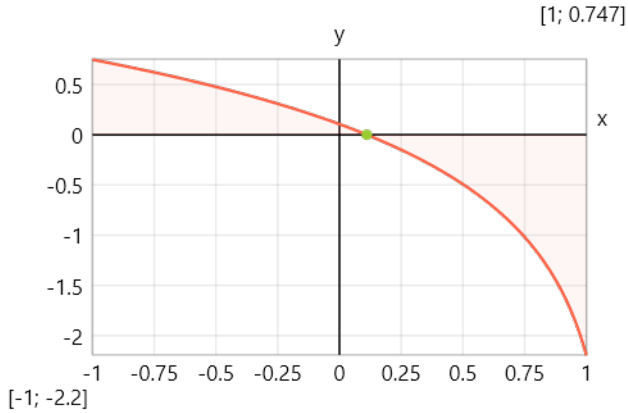
$$x_{67}=\$\text{Root}\left\{f_{67}(x)=0;\ x\in[-1;\ 1]\right\}=0.835$$

Exponential - $f_{68}(x)=\pi^x-e$



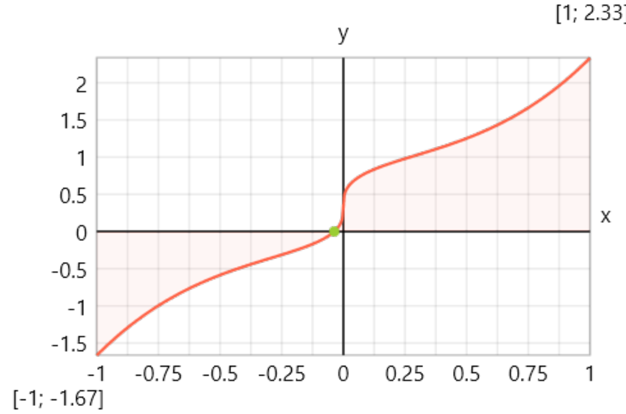
$$x_{68}=\$\text{Root}\left\{f_{68}(x)=0;\ x\in[-1;\ 1]\right\}=0.874$$

Logarithmic - $f_{69}(x)=\ln\left(\left|x-\frac{10}{9}\right|\right)$



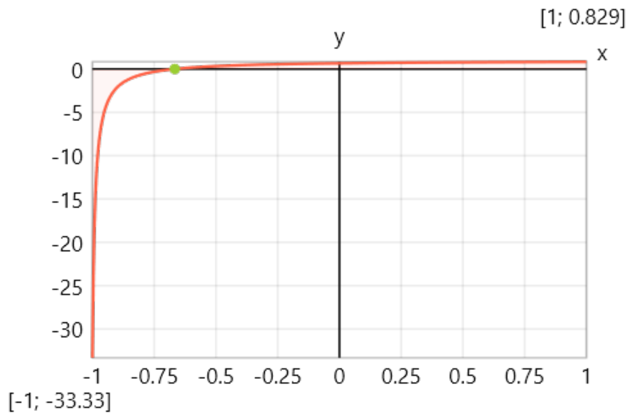
$x_{69}=\$\mathrm{Root}\left\{f_{69}(x)=0\ ;\ x\in[-1;\ 1]\right\}=0.111$

Polynomial - $f_{70}(x)=\frac{1}{3}+\mathrm{sign}(x)\cdot\sqrt[3]{|x|}+x^3$



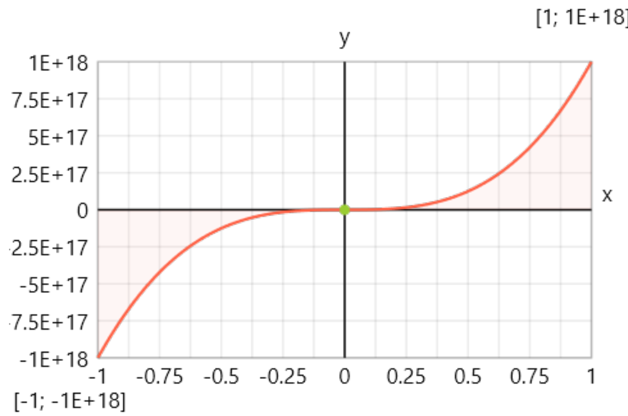
$x_{70}=\$\mathrm{Root}\left\{f_{70}(x)=0\ ;\ x\in[-1;\ 1]\right\}=-0.037$

Poly. Frac. - $f_{71}(x)=\frac{x+2/3}{x+101/100}$



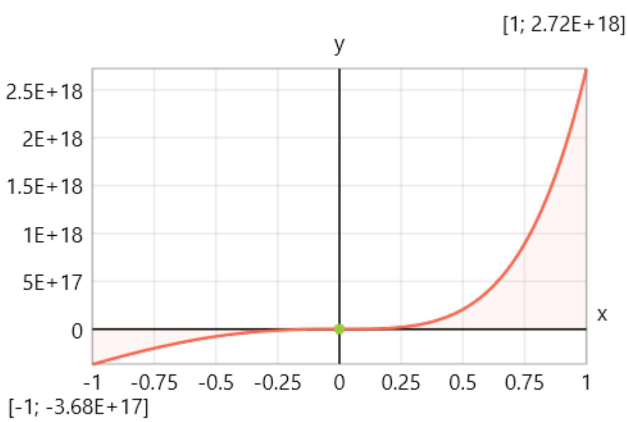
$x_{71}=\$\mathrm{Root}\left\{f_{71}(x)=0\ ;\ x\in[-1;\ 1]\right\}=-0.667$

Polynomial 3 - $f_{72}(x)=\left(x\cdot 10^6-1\right)^3$



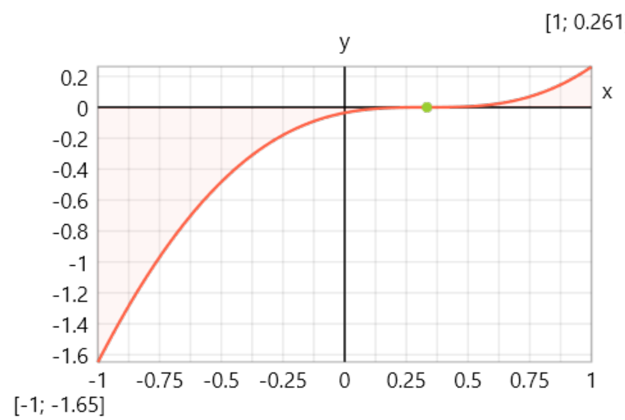
$x_{72}=\$\mathrm{Root}\left\{f_{72}(x)=0\ ;\ x\in[-1;\ 1]\right\}=10^{-6}$

Exp. Poly. - $f_{73}(x)=\exp(x)\cdot\left(x\cdot 10^6-1\right)^3$



$x_{73}=\$\mathrm{Root}\left\{f_{73}(x)=0\ ;\ x\in[-1;\ 1]\right\}=10^{-6}$

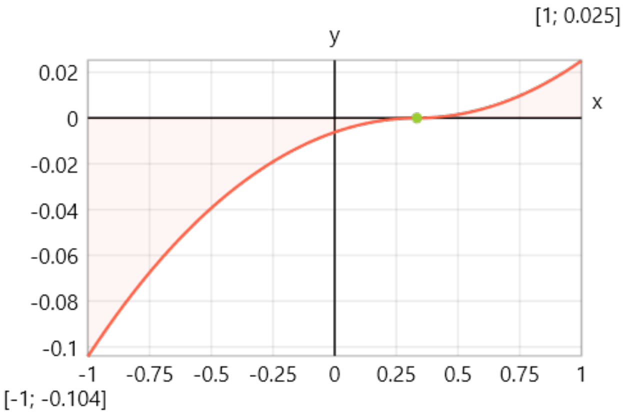
Tan. Poly. - $f_{74}(x)=\left(x-\frac{1}{3}\right)^2\cdot\left(\mathrm{atan}\left(x-\frac{1}{3}\right)\right)$



$x_{74}=\$\mathrm{Root}\left\{f_{74}(x)=0\ ;\ x\in[-1;\ 1]\right\}=0.333$

Circles

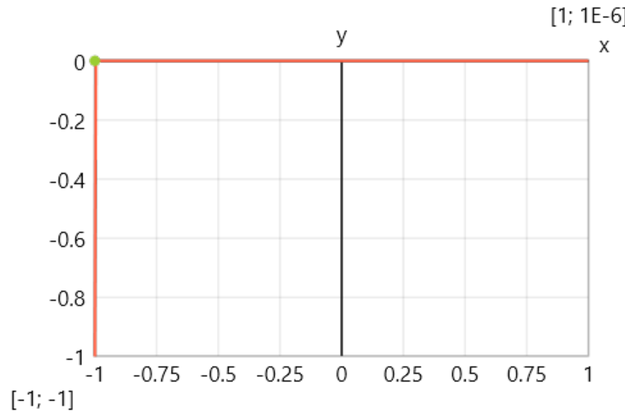
$$f_{75}(x) = \mathrm{sign}(3 \cdot x - 1) \cdot \left(1 - \sqrt{1 - \frac{(3 \cdot x - 1)^2}{81}}\right)$$



$$x_{75} = \$\mathrm{Root}\left\{f_{75}(x) = 0;\ x \in [-1;\ 1]\right\} = 0.333$$

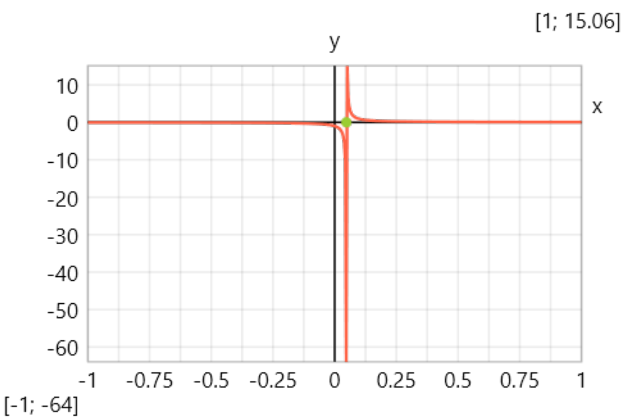
Step Function

$$f_{76}(x) = \begin{cases} \text{if } x > \frac{1 - 10^6}{10^6}: & \frac{1 + 10^6}{10^6} - 1 \\ \text{else:} & 0 \end{cases}$$



$$x_{76} = \$\mathrm{Find}\left\{f_{76}(x);\ x \in [-1;\ 1]\right\} = -1$$

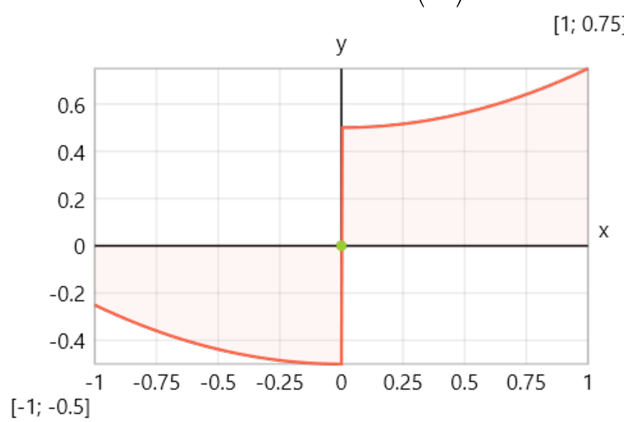
Geometric - $f_{77}(x) = \begin{cases} \text{if } x \neq \frac{1}{21}: & \frac{1}{21 \cdot x - 1} \\ \text{else:} & 0 \end{cases}$



$$x_{77} = \$\mathrm{Find}\left\{f_{77}(x);\ x \in [-1;\ 1]\right\} = 0.0476$$

Trunc. Poly.

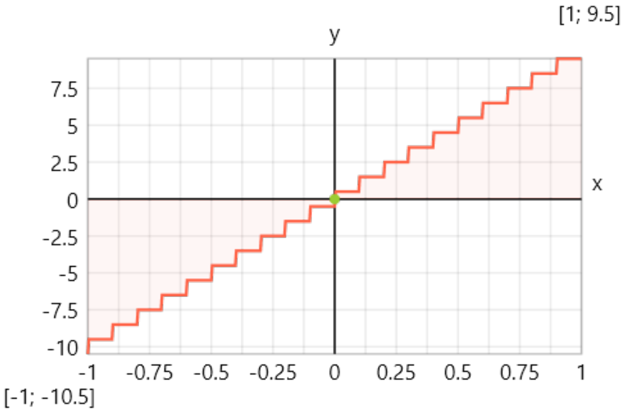
$$f_{78}(x) = \frac{x \cdot x}{4} + \mathrm{ceiling}\left(\frac{x}{2}\right) - 0.5$$



$$x_{78} = \$\mathrm{Find}\left\{f_{78}(x);\ x \in [-1;\ 1]\right\} = 7.11 \times 10^{-15}$$

Staircase

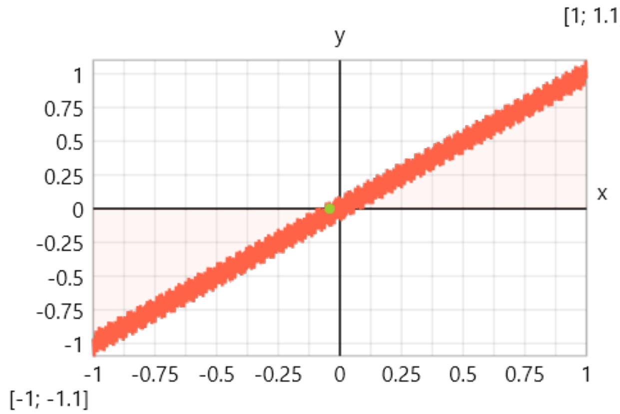
$$f_{79}(x)=\mathrm{ceiling}(10\cdot x-1)+0.5$$



$$x_{79}=\$\mathrm{Find}\{f_{79}(x);\ x\in[-1;\ 1]\}=2.91\times 10^{-19}$$

Noisy Line

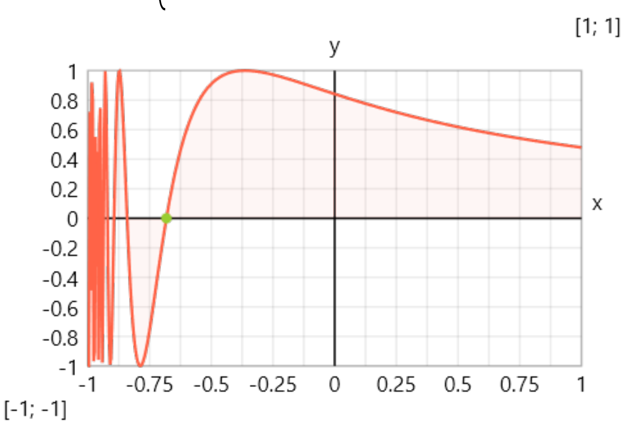
$$f_{80}(x)=x+\frac{\sin(x\cdot 10^{6})}{10}+10^{-3}$$



$$x_{80}=\$\mathrm{Root}\{f_{80}(x)=0;\ x\in[-1;\ 1]\}=-0.0415$$

Warsaw

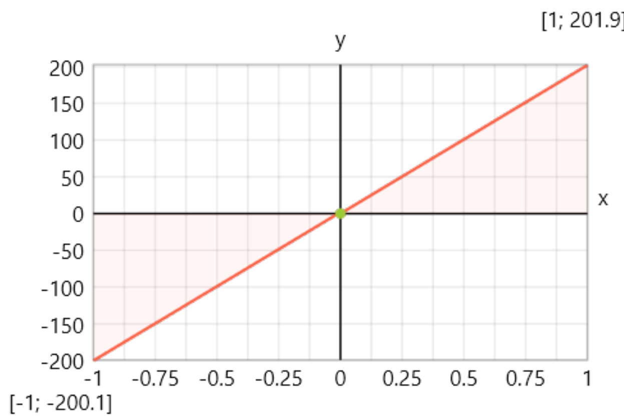
$$f_{81}(x)=\begin{cases}\text{if } x>(-1): & 1+\sin\left(\frac{1}{x+1}\right)-1\\ \text{else:} & 0\end{cases}$$



$$x_{81}=\$\mathrm{Root}\{f_{81}(x)=0;\ x\in[-1;\ 1]\}=-0.682$$

Sawtooth

$$f_{82}(x)=202\cdot x-2\cdot\mathrm{floor}\left(\frac{2\cdot x+10^{-2}}{2}\cdot 10^{-2}\right)-0.1$$

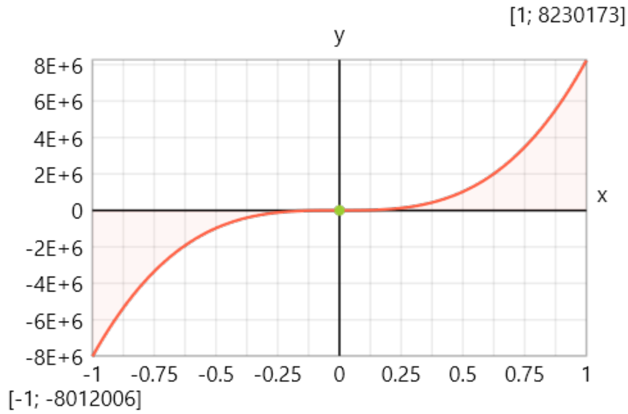


$$x_{82}=\$\mathrm{Root}\{f_{82}(x)=0;\ x\in[-1;\ 1]\}=0.000495$$

SciML Benchmarks test suite

Sawtooth Cube

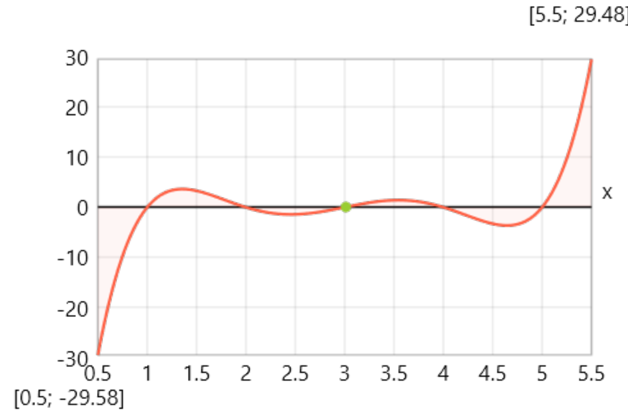
$$f_{83}(x)=\left(202\cdot x-2\cdot \mathrm{floor}\left(\frac{2\cdot x+10^{-2}}{2}\cdot 10^{-2}\right)-0.1\right)^{3}$$



$$x_{83}=\$\mathrm{Root}\left\{f_{83}(x)=0\,;\ x\in[-1;\ 1]\right\}=0.000495$$

Polynomial with multiple roots

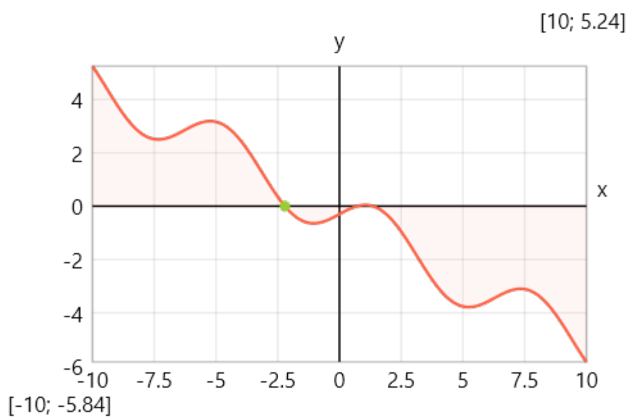
$$f_{84}(x)=(x-1)\cdot(x-2)\cdot(x-3)\cdot(x-4)\cdot(x-5)-0.05$$



$$x_{84}=\$\mathrm{Root}\left\{f_{84}(x)=0\,;\ x\in[0.5\,;\ 5.5]\right\}=3.01$$

Trigonometric with multiple roots

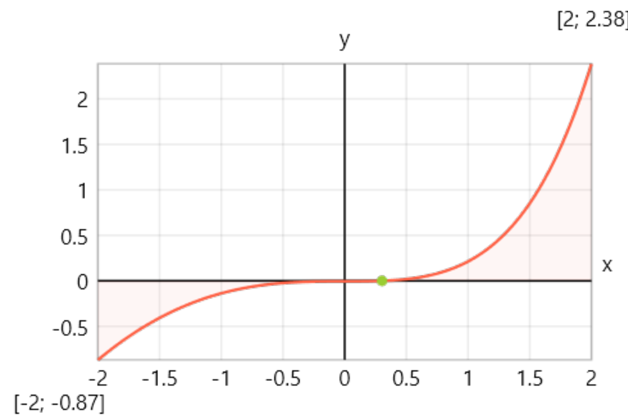
$$f_{85}(x)=\sin(x)-0.5\cdot x-0.3$$



$$x_{85}=\$\mathrm{Root}\left\{f_{85}(x)=0\,;\ x\in[-10;\ 10]\right\}=-2.21$$

Exponential function (sensitive near zero)

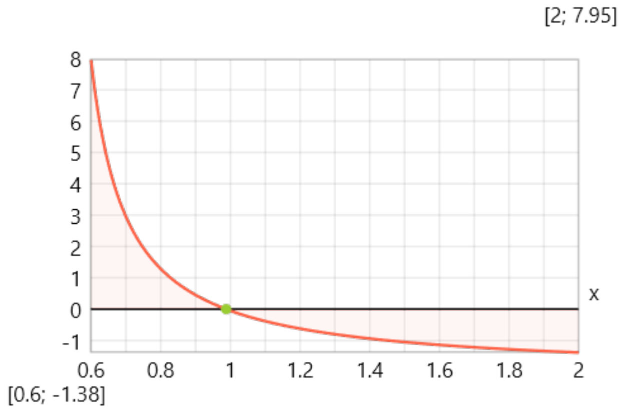
$$f_{86}(x)=\exp(x)-1-x-\frac{x\cdot x}{2}-0.005$$



$$x_{86}=\$\mathrm{Root}\left\{f_{86}(x)=0\,;\ x\in[-2;\ 2]\right\}=0.303$$

Rational function with pole

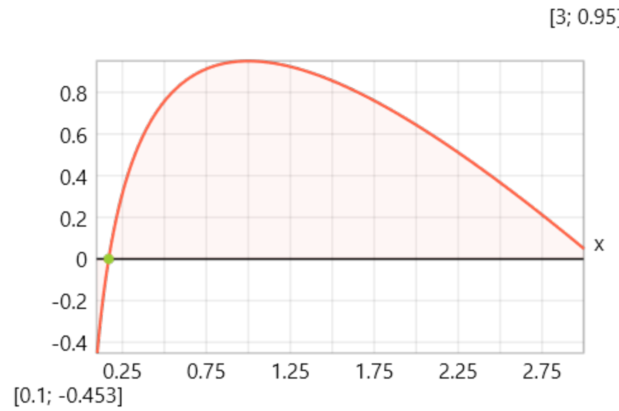
$$f_{87}(x) = \frac{1}{x-0.5} - 2 - 0.05$$



$$x_{87} = \$\text{Root}\left\{ f_{87}(x) = 0 ;\ x \in [0.6 ;\ 2] \right\} = 0.988$$

Logarithmic function

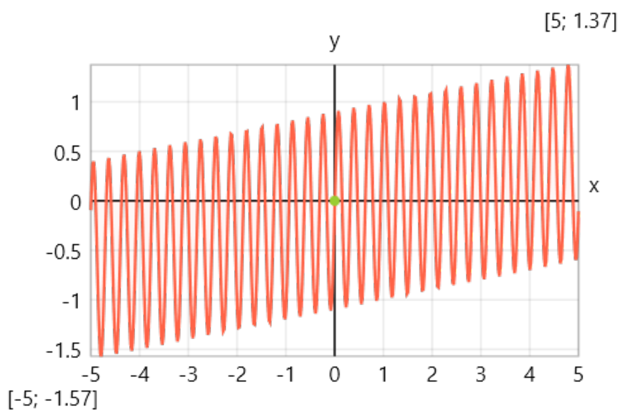
$$f_{88}(x) = \ln(x) - x + 2 - 0.05$$



$$x_{88} = \$\text{Root}\left\{ f_{88}(x) = 0 ;\ x \in [0.1 ;\ 3] \right\} = 0.168$$

High oscillation function

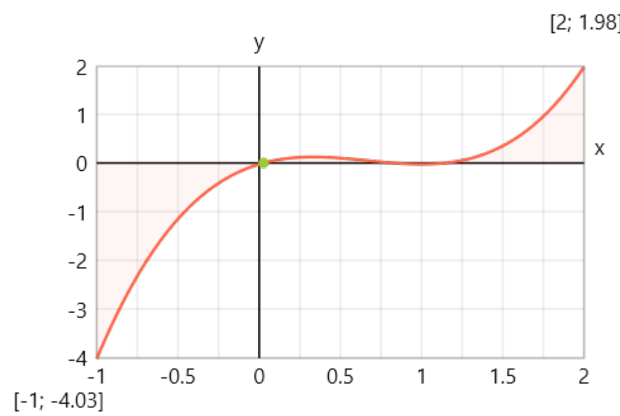
$$f_{89}(x) = \sin(20 \cdot x) + 0.1 \cdot x - 0.1$$



x_{89} = \$Root{$f_{89}(x)$ @ $x \in$ [-5.0; 5.0]} - No solution

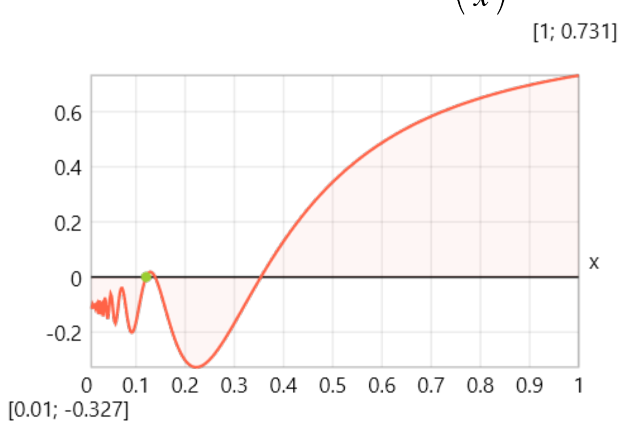
Function with very flat region

$$f_{90}(x) = x \cdot x \cdot x - 2 \cdot x \cdot x + x - 0.025$$



$$x_{90} = \$\text{Root}\left\{ f_{90}(x) = 0 ;\ x \in [-1 ;\ 2] \right\} = 0.0264$$

Bessel-like function - $f_{91}(x) = x \cdot \sin\left(\frac{1}{x}\right) - 0.1 - 0.01$



$$x_{91} = \$\text{Root}\left\{ f_{91}(x) = 0 ;\ x \in [0.01 ;\ 1] \right\} = 0.121$$