Analysis of $x \mapsto \frac{x^3-x^2+3\,x+9}{x^2-2}$

We consider the function defined by $f(x) = \frac{x^3-x^2+3\,x+9}{x^2-2}$.

Its domain of definition is $]-\infty\;;-\sqrt{2}\,[\;\cup\;]-\sqrt{2}\;;\sqrt{2}\,[\;\cup\;]\sqrt{2}\;;+\infty[$.

It is derivable on $]-\infty\;;-\sqrt{2}\,[\;\cup\;]-\sqrt{2}\;;\sqrt{2}\,[\;\cup\;]\sqrt{2}\;;+\infty[$.

Its derivative is $f'(x) = \frac{(x+1)^2\left(x^2-2\,x-6\right)}{(x^2-2)^2}$.

It admits the below limits:

$$\lim_{x\to-\infty} f(x) = -\infty$$

$$\lim_{\substack{x\to-\sqrt{2}\\<}} f(x) = -\infty$$

$$\lim_{\substack{x\to-\sqrt{2}\\>}} f(x) = +\infty$$

$$\lim_{\substack{x\to\sqrt{2}\\<}} f(x) = -\infty$$

$$\lim_{\substack{x\to\sqrt{2}\\>}} f(x) = +\infty$$

$$\lim_{x\to+\infty} f(x) = +\infty$$

The equations of its vertical asymptotes are:

$$x = -\sqrt{2}$$

$$x = \sqrt{2}$$

The equation of its oblique asymptote is:

$$y = x - 1$$

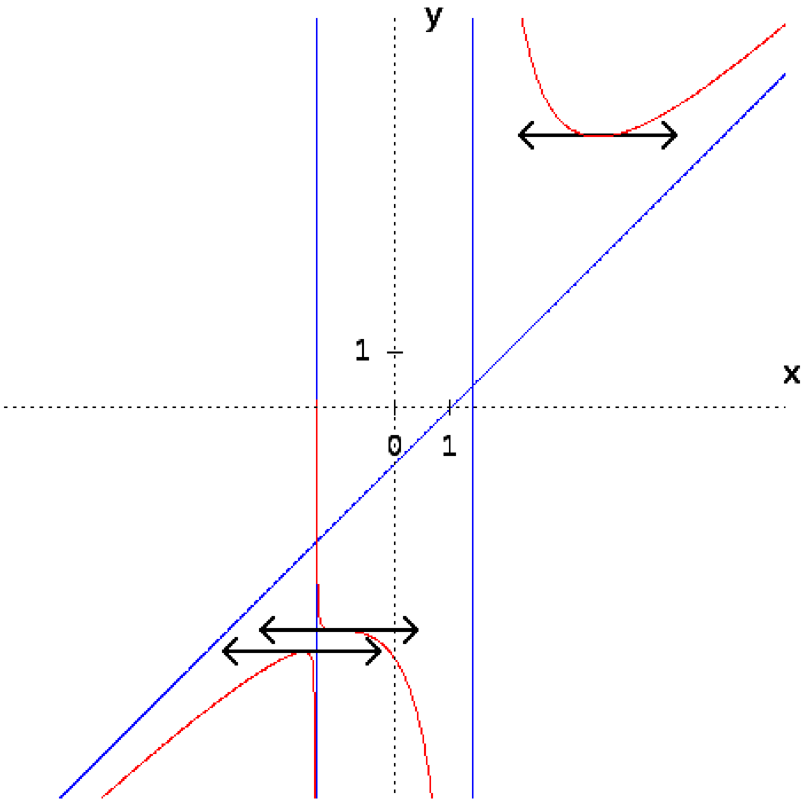
A table of values is:

x	$1-\sqrt{7} \approx -1.64$	-1	$\sqrt{7}+1 \approx 3.64$
$f(x)$	$\frac{11\cdot\sqrt{7}}{2\cdot\sqrt{7}-6} - \frac{26}{2\cdot\sqrt{7}-6} \approx -4.38$	-4	$\frac{11\cdot\sqrt{7}}{2\cdot\sqrt{7}+6} + \frac{26}{2\cdot\sqrt{7}+6} \approx 4.88$

Its table of variations is:

x	$-\infty$		$1-\sqrt{7}$		$-\sqrt{2}$		-1		$\sqrt{2}$		$\sqrt{7}+1$		$+\infty$
$f'(x)$		$+$	0	$-$	‖	$-$	0	$-$	‖	$-$	0	$+$	
$f(x)$	$-\infty$	↗	$\frac{11\cdot\sqrt{7}}{2\cdot\sqrt{7}-6} - \frac{26}{2\cdot\sqrt{7}-6}$	↘	$-\infty$ ‖ $+\infty$	↘	-4	↘	$-\infty$ ‖ $+\infty$	↘	$\frac{11\cdot\sqrt{7}}{2\cdot\sqrt{7}+6} + \frac{26}{2\cdot\sqrt{7}+6}$	↗	$+\infty$

Its graph is:



Note: these results have been obtained from an automated program and are not guaranteed to be exact.

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