WolframAlpha computational knowledge engine

(2/3)*((1+3*(x*((-1/6)*j-(1/3))+(1/6)*j+(1/3))-j))/(x*((-1/6)*j-(1/3))+(1/6)*j+(1/3))

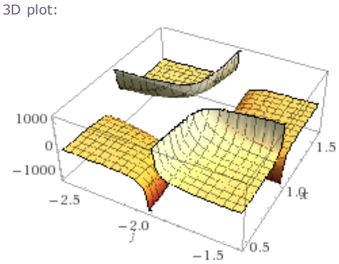
Input:

$$\frac{2}{3} \times \frac{1+3\left(x\left(-\frac{j}{6}-\frac{1}{3}\right)+\frac{1}{6}\,j+\frac{1}{3}\right)-j}{x\left(-\frac{j}{6}-\frac{1}{3}\right)+\frac{1}{6}\,j+\frac{1}{3}}$$

Exact result:

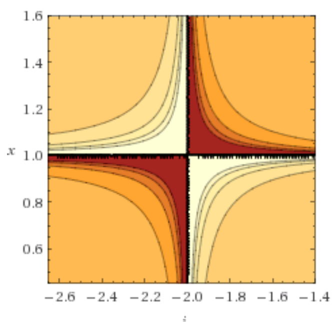
$$\frac{2\left(3\left(\left(-\frac{j}{6}-\frac{1}{3}\right)x+\frac{j}{6}+\frac{1}{3}\right)-j+1\right)}{3\left(\left(-\frac{j}{6}-\frac{1}{3}\right)x+\frac{j}{6}+\frac{1}{3}\right)}$$

3D plot: Show contour lines



Enable interactivity

Contour plot:



Enable interactivity

Alternate forms: More forms Step-by-step solution

$$\frac{2\,(j\,(-x)-j-2\,x+4)}{(j+2)\,(1-x)}$$

$$\frac{4\,(j-1)}{(j+2)\,(x-1)}+2$$

$$\frac{2\,(j\,x+j+2\,x-4)}{(j+2)\,(x-1)}$$

Alternate form assuming j and x are positive:

$$-\frac{2\,j}{3\left(\left(-\frac{j}{6}-\frac{1}{3}\right)x+\frac{j}{6}+\frac{1}{3}\right)}+\frac{2}{3\left(\left(-\frac{j}{6}-\frac{1}{3}\right)x+\frac{j}{6}+\frac{1}{3}\right)}+2$$

Expanded form: Step-by-step solution

$$\frac{2\,j\,x+2\,j+4\,x-8}{j\,x-j+2\,x-2}$$

Root:

$$j+2\neq 0,\quad x=\frac{4-j}{j+2},\quad j-1\neq 0$$

Integer roots:

More roots

$j=-8,\quad x=-2$

$j=-5,\quad x=-3$

$j=-4,\quad x=-4$

$j=-3,\quad x=-7$

$j=-1,\quad x=5$

Property as a real function:

Domain:

$$\{x\in\mathbb{R}: j+2\neq 0 \text{ and } x\neq 1\}$$

$\mathbb{R}$ is the set of real numbers »

Series expansion at x=0:

$$\frac{8-2j}{j+2}+\frac{(4-4j)x}{j+2}+\frac{(4-4j)x^2}{j+2}+\frac{(4-4j)x^3}{j+2}+\frac{(4-4j)x^4}{j+2}+O(x^5)$$

Series expansion at x=∞:

$$2+\frac{4(j-1)}{(j+2)x}+\frac{4(j-1)}{(j+2)x^2}+\frac{4(j-1)}{(j+2)x^3}+O\left(\left(\frac{1}{x}\right)^4\right)$$

Derivative:

Step-by-step solution

$$\frac{d}{dx}\left(\frac{2\left(1-j+3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)\right)}{3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)}\right)=-\frac{4(j-1)}{(j+2)(x-1)^2}$$

Indefinite integral:

Step-by-step solution

$$\int\frac{2\left(1-j+3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)\right)}{3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)}\,dx=\frac{2((j+2)(x-1)+2(j-1)\log(x-1))}{j+2}+\text{constant}$$

$\log(x)$ is the natural logarithm »

Limit:

$$\lim_{x\to\pm\infty}\frac{2\left(1-j+3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)\right)}{3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)}=2$$

Series representations:

$$\frac{2\left(1-j+3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)\right)}{3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)}=\frac{8-2j}{2+j}+\sum_{n=1}^{\infty}\frac{x^n(4-4j)}{2+j}$$

$$\frac{2\left(1-j+3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)\right)}{3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)}=2+\sum_{n=1}^{\infty}\frac{(-1+j)^n\left(-4\left(-\frac{1}{3}\right)^n\right)}{-1+x}$$

$$\frac{2\left(1-j+3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)\right)}{3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)}=\frac{2(-2+x)}{-1+x}+\sum_{n=1}^{\infty}\frac{j^n\left(-3(-1)^n 2^{1-n}\right)}{-1+x}$$

$$\frac{2\left(1-j+3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)\right)}{3\left(\frac{1}{3}+\frac{j}{6}+\left(-\frac{1}{3}-\frac{j}{6}\right)x\right)}=\sum_{n=-\infty}^{\infty}\left(\begin{cases}2 & n=0\\ \frac{4(-1+j)}{2+j} & n=-1\end{cases}\right)(-1+x)^n$$

Computed by Wolfram *Mathematica*

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