appVersion(4) = "0.99.7921.69"

$$X := \begin{bmatrix} -1 \\ -0.5 \\ 0 \\ 0.5 \\ 1.0 \end{bmatrix} \qquad Y := \begin{bmatrix} 0.0385 \\ 0.1379 \\ 1 \\ 0.1379 \\ 0.0385 \end{bmatrix}$$

$$N := \text{rows}(X) = 5 \qquad M_{N,N} := 0$$

for $i \in [1..(N-1)]$

$$h_i := X_{i+1} - X_i$$

$$D1_i := \frac{Y_{i+1} - Y_i}{h_i}$$

$$h = \begin{bmatrix} 0.5 \\ 0.5 \\ 0.5 \\ 0.5 \end{bmatrix} \qquad D1 = \begin{bmatrix} 0.1988 \\ 1.7242 \\ -1.7242 \\ -0.1988 \end{bmatrix}$$

$$d_1 := 0 \qquad d_N := 0$$

for $j \in [2..(N-1)]$

$$b_j := \frac{h_{j-1}}{h_{j-1} + h_j}$$

$$c_j := \frac{h_j}{h_{j-1} + h_j}$$

$$d_j := \frac{6}{h_{j-1} + h_j} \cdot (D1_j - D1_{j-1})$$

$$b = \begin{bmatrix} 0 \\ 0.5 \\ 0.5 \\ 0.5 \end{bmatrix} \qquad c = \begin{bmatrix} 0 \\ 0.5 \\ 0.5 \\ 0.5 \end{bmatrix} \qquad d = \begin{bmatrix} 0 \\ 9.1524 \\ -20.6904 \\ 9.1524 \\ 0 \end{bmatrix}$$

$MM :=$ for $i \in [2..(N-1)]$

$$M_{i,i-1} := b_i$$

$$M_{i,i} := 2$$

$$M_{i,i+1} := c_i$$

$M$

$$M := MM \qquad M_{1,1} := 1 \qquad M_{N,N} := 1$$

$$M_{1,2} := -\left(1 + \frac{h_1}{h_2}\right) \qquad M_{1,3} := \frac{h_1}{h_2} \qquad M_{N,N-2} := \frac{h_{N-1}}{h_{N-2}} \qquad M_{N,N-1} := -\left(1 + \frac{h_{N-1}}{h_{N-2}}\right)$$

$$M = \begin{bmatrix} 1 & -2 & 1 & 0 & 0 \\ 0.5 & 2 & 0.5 & 0 & 0 \\ 0 & 0.5 & 2 & 0.5 & 0 \\ 0 & 0 & 0.5 & 2 & 0.5 \\ 0 & 0 & 1 & -2 & 1 \end{bmatrix}$$

$$Y'' := M^{-1} \cdot d = \begin{bmatrix} 17.972 \\ 3.051 \\ -11.871 \\ 3.051 \\ 17.972 \end{bmatrix}$$

- cspline(X,Y)

Clear(a, b, c, d) = 1

for $i \in [1..(N-1)]$

$$d_i := \frac{Y''_{i+1} - Y''_i}{6 \cdot (X_{i+1} - X_i)}$$

$$c_i := \frac{1}{2} \cdot Y''_i - 3 \cdot d_i \cdot X_i$$

$$b_i := \left(\frac{X_i}{2} - \frac{X_{i+1}}{2}\right) \cdot Y''_i + \frac{Y_{i+1} - Y_i}{X_{i+1} - X_i} - 2 \cdot X_i \cdot c_i - d_i \cdot \left(3 \cdot X_i^2 + (X_{i+1} - X_i)^2\right)$$

$$a_i := Y_i - c_i \cdot X_i^2 - b_i \cdot X_i - d_i \cdot X_i^3$$

$$a = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} \qquad b = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \qquad c = \begin{bmatrix} -5.9353 \\ -5.9353 \\ -5.9353 \\ -5.9353 \end{bmatrix} \qquad d = \begin{bmatrix} -4.9738 \\ -4.9738 \\ 4.9738 \\ 4.9738 \end{bmatrix}$$

for $i \in [1..(N-1)]$

$$poly_{1\,i} := a_i$$

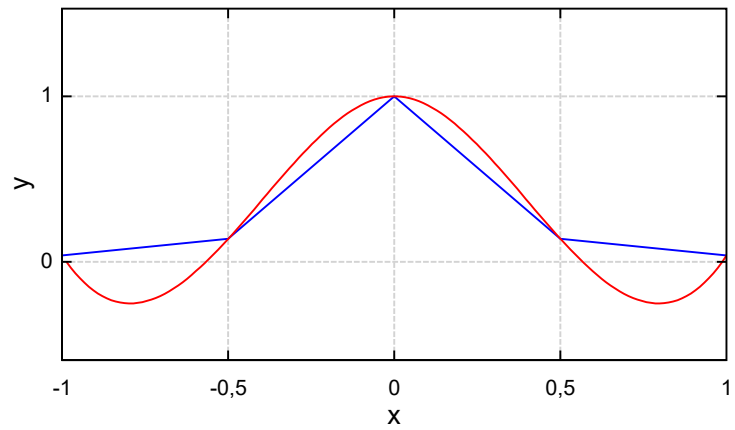
$$poly_{2\,i} := b_i$$

$$poly_{3\,i} := c_i$$

$$poly_{4\,i} := d_i$$

$$poly = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \\ -5.9353 & -5.9353 & -5.9353 & -5.9353 \\ -4.9738 & -4.9738 & 4.9738 & 4.9738 \end{bmatrix}$$

$$s(x) := \left| \begin{array}{l} k := \text{round}\left(\frac{x - X_1}{X_2 - X_1} + 0.5,\ 0\right) \\ poly_{4\,k} \cdot x^3 + poly_{3\,k} \cdot x^2 + poly_{2\,k} \cdot x + poly_{1\,k} \end{array} \right.$$




$$\begin{cases} \text{augment}(X, Y) \\ s(x) \end{cases}$$