

appVersion(3) = "0.99.7030"

ORIGIN = 1 Mathcad 11

$$B(k, x, j, t) := \left. \begin{array}{l} n := \text{rows}(t) \\ \left\{ \begin{array}{l} \text{ans} := 0 \\ \text{ans} := 0 \\ \left\{ \begin{array}{l} \text{ans} := 0 \text{ if } x = (t_{j+1+k}) \\ \text{ans} := 1 \text{ if } x = t_n \\ \text{ans} := 1 \text{ if } t_{j+1+k} = t_j \\ \text{ans} := 1 \text{ otherwise} \end{array} \right. \\ \text{ans} := 0 \end{array} \right. \\ \text{ans} := \frac{t_{j+1+k}^{-x}}{t_{j+1+k}^{-t_{j+1}}} \cdot B(k-1, x, j+1, t) \\ \text{ans} := \left(\frac{x - t_j}{t_{j+k}^{-t_j}} \cdot B(k-1, x, j, t) \right) \\ \text{ans} := \left(\frac{x - t_j}{t_{j+k}^{-t_j}} \cdot B(k-1, x, j, t) + \frac{t_{j+1+k}^{-x}}{t_{j+1+k}^{-t_{j+1}}} \cdot B(k-1, x, j+1, t) \right) \end{array} \right\} \text{ans}$$

if $((j < 0) \vee (k < 0)) \vee (n < (j + 1 + k))$

if $(x < t_j) \vee (x > t_{j+1+k})$

if $k = 0$

if $(t_{j+k} = t_j) \wedge (t_{j+k+1} = t_{j+1})$

if $t_{j+k} = t_j$

if $t_{j+1+k} = t_{j+1}$

otherwise

if $((j < 0) \vee (k < 0)) \vee (n < (j + 1 + k))$

if $(x < t_j) \vee (x > t_{j+1+k})$

if $k = 0$

if $(t_{j+k} = t_j) \wedge (t_{j+k+1} = t_{j+1})$

if $t_{j+k} = t_j$

if $t_{j+1+k} = t_{j+1}$

otherwise

t = "vector of knots"

order = "the order of Bspline"

j = "the specific spline among the 5 possible"

x = "floating value in the j _spline "

knot := [0 0 0 0 0 0 5 10 10 10 10 10]^T

order := 5 x := 0 n := 1

$$B(\text{order}, x, n, \text{knot}) = 1$$

$k := 5$ $j := 2$ $t := \text{knot}$

$B(k, x, j, t) = 0$

$\text{Bspline}(n, x) := B(k, x, n, t)$

$\text{pts} := 200$

$i := [1..(\text{pts} + 1)]$

$x_i := -1.06 + \frac{i}{\text{pts}} \cdot 12$

$y0_i := \text{Bspline}(1, x_i)$

$y1_i := \text{Bspline}(2, x_i)$

$y3_i := \text{Bspline}(3, x_i)$

$y4_i := \text{Bspline}(4, x_i)$

$y5_i := \text{Bspline}(5, x_i)$

$y6_i := \text{Bspline}(6, x_i)$

$y7_i := \text{Bspline}(7, x_i)$

$y8_i := \text{Bspline}(8, x_i)$

Set the spline degree

order := 5

Create some simplified B-spline functions based on this particular set of knots

$x_{\text{knot}} := (0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 5 \ 10 \ 10 \ 10 \ 10 \ 10 \ 10)^T$

$B(n, x) := Bt(\text{order}, x, n, x_{\text{knot}})$

$B'(n, x) := Bt'(\text{order}, x, n, x_{\text{knot}})$

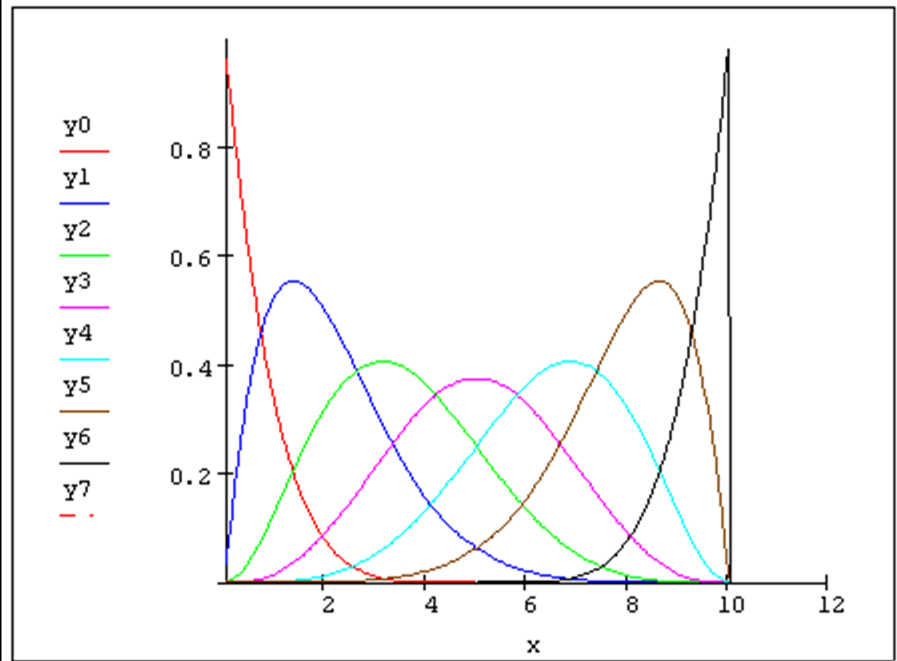
npts := 200 $i := 1.. \text{npts} + 1$

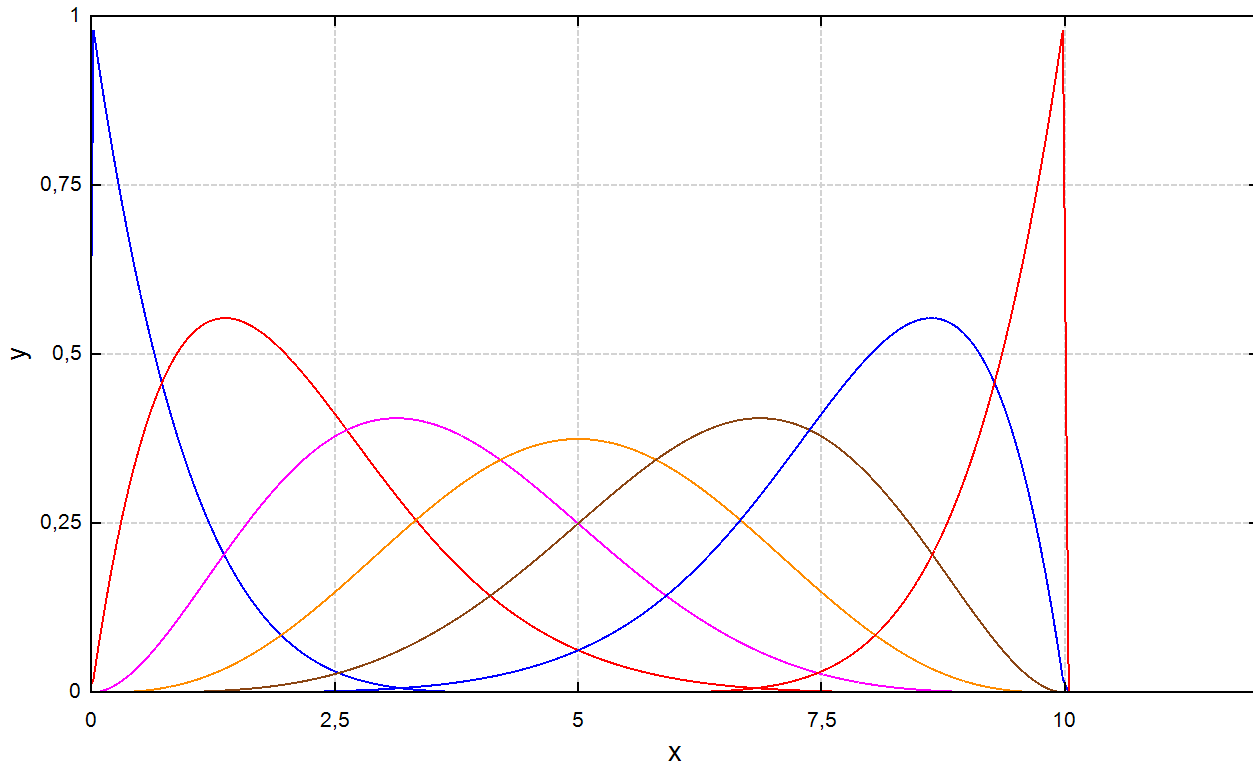
$x_i := -1.06 + \frac{i}{\text{npts}} \cdot 12$

Compute several splines starting at the first spline

$y0_i := B(1, x_i)$ $y1_i := B(2, x_i)$ $y2_i := B(3, x_i)$ $y3_i := B(4, x_i)$

$y4_i := B(5, x_i)$ $y5_i := B(6, x_i)$ $y6_i := B(7, x_i)$ $y7_i := B(8, x_i)$





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{ augment(x, y0)  
  augment(x, y1)  
  augment(x, y2)  
  augment(x, y3)  
  augment(x, y4)  
  augment(x, y5)  
  augment(x, y6)  
  augment(x, y7)  
  augment(x, y8)
```