Variabile strutturate

$$[x, \, Cmat, \, \ell, \, k] = unmkpp(s3)$$

dd

output di spline (x,y)

breaks : x

coefs : $Cmat$

pieces : ℓ

order : k

dim : dd

$x = s3.breaks$

$Cmat = s3.coefs$

$\ell = s3.pieces$

$k = s3.order$

$dd = s3.dim$

INTEGRALE DEFINITO DI UNA SPLINE CUBICA

$$S_3(x)\Big|_{[x_j,\, x_{j+1}]} = \overbrace{c_{j1}(x-x_j)^3 + c_{j2}(x-x_j)^2 + c_{j3}(x-x_j) + c_{j4}}^{s_j(x)}$$

x_j $\qquad$ x_{j+1}

h (nodi equispaziati)

$h = x_{j+1} - x_j \quad \forall j$

$$\int_{x_j}^{x_{j+1}} \underbrace{s_j(x)}_{c_{j1}(x-x_j)^3 + c_{j2}(x-x_j)^2 + c_{j3}(x-x_j) + c_{j4}}\, dx = I_j$$

<u>1° modo</u>: $t = x - x_j$ $\qquad$ $x = x_j$ $\; t = 0$

$dt = dx$ $\qquad$ $x = x_{j+1}$ $\; t = x_{j+1} - x_j$

p=polyint($c_{j.}$) $\qquad \displaystyle\int_0^{(x_{j+1}-x_j)} (c_{j1}t^3 + c_{j2}t^2 + c_{j3}t + c_{j4})\,dt$

polyval(p, x(j+1)-x(j))- polyval(p, 0) $\Rightarrow I_j$

inte_spline3_a.m

2° modo

$$I_j = \int_{x_j}^{x_{j+1}} \left(c_{j1}(x-x_j)^3 + c_{j2}(x-x_j)^2 + c_{j3}(x-x_j) + c_{j4} \right) dx$$

$$= \left[c_{j1}\frac{(x-x_j)^4}{4} + c_{j2}\frac{(x-x_j)^3}{3} + c_{j3}\frac{(x-x_j)^2}{2} + c_{j4}(x-x_j) \right]_{x_j}^{x_{j+1}}$$

$$= \frac{h^4}{4} \cdot c_{j1} + \frac{h^3}{3} c_{j2} + \frac{h^2}{2} c_{j3} + h\, c_{j4}$$

inte_spline3_b.m

$$\int_{x_0}^{x_n} s_3(x)\, dx = I_1 + I_2 + \dots + I_n$$