```
> restart :
> Polinômio Linear
```

$$Polinômio\ Linear \tag{1}$$

```
> x0 := 1 :
> x1 := 2 :
> x2 := 3 :
> x3 := 4 :
> x4 := 5 :
>
> y0 := 0.9 :
> y1 := 1.2 :
> y2 := 0.8 :
> y3 := 1.3 :
> y4 := 1.5 :
>
> h := 1 :
>
> f[x0, x1] := (y1 - y0)/(x1 - x0);
```

$$f_{1,\,2} := 0.3 \tag{2}$$

```
> f[x1, x2] := (y2 - y1)/(x2 - x1);
```

$$f_{2,\,3} := -0.4 \tag{3}$$

```
> f[x2, x3] := (y3 - y2)/(x3 - x2);
```

$$f_{3,\,4} := 0.5 \tag{4}$$

```
> f[x3, x4] := (y4 - y3)/(x4 - x3);
```

$$f_{4,\,5} := 0.2 \tag{5}$$

```
> f[x0, x1, x2] := (f[x1, x2] - f[x0, x1])/(2 · h);
```

$$f_{1,\,2,\,3} := -0.3500000000 \tag{6}$$

```
> f[x1, x2, x3] := (f[x2, x3] - f[x1, x2])/(2 · h);
```

$$f_{2,\,3,\,4} := 0.4500000000 \tag{7}$$

```
> f[x2, x3, x4] := (f[x3, x4] - f[x2, x3])/(2 · h);
```

$$f_{3,\,4,\,5} := -0.1500000000 \tag{8}$$

```
> f[x0, x1, x2, x3] := (f[x1, x2, x3] - f[x0, x1, x2])/(3 · h);
```

$$f_{1,\,2,\,3,\,4} := 0.2666666667 \tag{9}$$

> $f[x1, x2, x3, x4] := \frac{f[x2, x3, x4] - f[x1, x2, x3]}{3 \cdot h}$;

$$f_{2,3,4,5} := -0.2000000000 \quad (10)$$

> $f[x0, x1, x2, x3, x4] := \frac{f[x1, x2, x3, x4] - f[x0, x1, x2, x3]}{4 \cdot h}$;

$$f_{1,2,3,4,5} := -0.1166666667 \quad (11)$$

>

> ***Polinomio de primeiro grau letra a***

Polinomio de primeiro grau letra a (12)

> $P11(x) := y0 + f[x0, x1] \cdot (x - x0)$;

$$P11(x) := 0.6 + 0.3\,x \quad (13)$$

> $P12(x) := y1 + f[x1, x2] \cdot (x - x1)$;

$$P12(x) := 2.0 - 0.4\,x \quad (14)$$

> $P13(x) := y2 + f[x2, x3] \cdot (x - x2)$;

$$P13(x) := -0.7 + 0.5\,x \quad (15)$$

> $P14(x) := y3 + f[x3, x4] \cdot (x - x3)$;

$$P14(x) := 0.5 + 0.2\,x \quad (16)$$

>

>

> ***Polinomio de segundo grau letra c***

Polinomio de segundo grau letra c (17)

>

> $P21(x) := y0 + f[x0, x1] \cdot (x - x0) + f[x0, x1, x2] \cdot (x - x0) \cdot (x - x1)$;

$$P21(x) := 0.6 + 0.3\,x - 0.3500000000\,(x - 1)\,(x - 2) \quad (18)$$

> $P22(x) := y2 + f[x2, x3] \cdot (x - x2) + f[x2, x3, x4] \cdot (x - x2) \cdot (x - x3)$;

$$P22(x) := -0.7 + 0.5\,x - 0.1500000000\,(x - 3)\,(x - 4) \quad (19)$$

>

Resposta da letra a temos que 70 *dias corresposnde a x entre*[*x1*, *x2*] *temos que* 70 *dias corresponde a* $x = 2.3$

> $x := 2.3$:

> $P12(2.3)$;

$$1.08 \quad (20)$$

>

Resposta da letra a temos que 100 *dias corresposnde a x entre*[*x2*, *x3*] *temos que* 100 *dias corresponde a* $x = 3.3$

> $x := 3.3$:

> $P13(x)$;

$$0.95 \quad (21)$$

Resposta da letra c temos que 70 *dias corresposnde a x entre*[*x0*, *x1*, *x2*] *temos que* 70 *dias corresponde a* $x = 2.3$

```
> x := 2.3 :
> P22(x);
```

0.2715000000 **(22)**

```
>
```

Resposta da letra c temos que 100 *dias corresposnde a x entre*[*x2*, *x3*, *x4*] *temos que* 100 *dias corresponde a x* = 3.3

```
> x := 3.3 :
> P22(x);
```

0.9815000000 **(23)**

(24)

```
> Calculando os erros
```

Calculando os erros **(25)**

Erro da letra a :

```
> x := 2.3 :
> Erro := |(x - x1)·(x - x2)|··max(|f[x0, x1, x2]|, |f[x1, x2, x3, ]|, |f[x2, x3, x4]|);
```

Erro := 0.4954486879 **(26)**

```
>
> x := 3.3 :
> Erro := |(x - x1)·(x - x2)|··max(|f[x0, x1, x2]|, |f[x1, x2, x3, ]|, |f[x2, x3, x4]|);
```

Erro := 0.6546046306 **(27)**

```
>
>
```

Erro da letra a :

```
> x := 2.3 :
> Erro := |(x - x0)·(x - x1)·(x - x2)|·max(|f[x0, x1, x2, x3]|, |f[x1, x2, x3, x4]|);
```

Erro := 0.07280000001 **(28)**

```
> x := 3.3 :
> Erro := |(x - x2)·(x - x3)·(x - x4)|·max(|f[x0, x1, x2, x3]|, |f[x1, x2, x3, x4]|);
```

Erro := 0.09520000001 **(29)**

```
>
>
>
> Spline Cúbica
```

Spline Cúbica **(30)**

```
>
>
> with(linalg) :
> y0 := 0.8 :
> y1 := 1.2 :
> y2 := 0.9 :
> y3 := 1.3 :
```

```
> y4 := 1.5 :
>
> x0 := 1 :
> x1 := 2 :
> x2 := 3 :
> x3 := 4 :
> x4 := 5 :
>
> h1 := 1 :
> h2 := 1 :
> h3 := 1 :
> h4 := 1 :
>
> x[0] := array(1..5, [x0, x1, x2, x3, x4, ]) :;
> b1 := 6·((y2 − y1)/h2 - (y1 − y0)/h1);
```

$$b1 := -4.2 \tag{31}$$

```
> b2 := 6·((y3 − y2)/h3 - (y2 − y1)/h2);
```

$$b2 := 4.2 \tag{32}$$

```
> b3 := 6·((y4 − y3)/h4 - (y3 − y2)/h3);
```

$$b3 := -1.2 \tag{33}$$

```
> a11 := 2·(h1 + h2) :;
> a12 := (h2) :;
> a21 := a12 :;
> a13 := 0 :
> a31 := a13 :
> a23 := h3 :
> a32 := a23 :
> a22 := 2·(h2 + h3) :
> a33 := 2·(h3 + h4) :
> A := matrix(3, 3, [[a11, a12, a13], [a21, a22, a23], [a31, a32, a33]]);
```

$$A := \begin{bmatrix} 4 & 1 & 0 \\ 1 & 4 & 1 \\ 0 & 1 & 4 \end{bmatrix} \tag{34}$$

```
> b := vector(3, [b1, b2, b3]);
```

$$b := \begin{bmatrix} -4.2 & 4.2 & -1.2 \end{bmatrix} \tag{35}$$

```
> Y2[2] := linsolve(A, b);
```

$$Y2_2 := \begin{bmatrix} -1.446428572 & 1.585714286 & -0.6964285715 \end{bmatrix} \tag{36}$$

```
> Y0[2] := 0 :
> Y1[2] := Y2[2][1];:
```

(37)

$$Y1_2 := -1.446428572 \quad (37)$$

> $Y2[2] := Y2[2][2];:$

$$Y2_2 := 1.585714286 \quad (38)$$

> $Y3[2] := \frac{510}{7};$

$$Y3_2 := \frac{510}{7} \quad (39)$$

> $Y4[2] := 0;:$

$$Y4_2 := 0 \quad (40)$$

> $YY2 := vector(5, [Y0[2], Y1[2], Y2[2], Y3[2], Y4[2]]);$

$$YY2 := \begin{bmatrix} 0 & -1.446428572 & 1.585714286 & \frac{510}{7} & 0 \end{bmatrix} \quad (41)$$

> *YY2 é o vetor da segunda derivada*

YY2 é o vetor da segunda derivada (42)

>

> *Calculo da primeira deivada da spline cúbica* :

>

> $Y0[1] := \left(\frac{(y1-y0)}{h1}\right) - \frac{h1}{6}\cdot(Y1[2] + 2\cdot Y0[2]);$

$$Y0_1 := 0.6410714287 \quad (43)$$

> $Y1[1] := \left(\frac{(y2-y1)}{h2}\right) - \frac{h2}{6}\cdot(Y2[2] + 2\cdot Y1[2]);$

$$Y1_1 := -0.0821428570 \quad (44)$$

> $Y2[1] := \left(\frac{(y3-y2)}{h3}\right) - \frac{h3}{6}\cdot(Y3[2] + 2\cdot Y2[2]);$

$$Y2_1 := -12.27142857 \quad (45)$$

> $Y3[1] := \left(\frac{(y4-y3)}{h4}\right) - \frac{h4}{6}\cdot(Y4[2] + 2\cdot Y3[2]);$

$$Y3_1 := -24.08571429 \quad (46)$$

> $YY1 := vector(4, [Y0[1], Y1[1], Y2[1], Y3[1]]);$

$$YY1 := \begin{bmatrix} 0.6410714287 & -0.0821428570 & -12.27142857 & -24.08571429 \end{bmatrix} \quad (47)$$

> *YY1 é a primeira derivada;*

YY1 é a primeira derivada (48)

> $S1(x) := y0 + Y0[1]\cdot(x-x0) + \frac{Y0[2]}{2}\cdot(x-x0)^2 + \frac{1}{(6\cdot h2)}\cdot(Y1[2]-Y0[2])\cdot(x-x0)^3;$

$$S1(x) := 0.1589285713 + 0.6410714287\,x - 0.2410714287\,(x-1)^3 \quad (49)$$

>

> $S2(x) := y1 + Y1[1]\cdot(x-x1) + \frac{Y1[2]}{2}\cdot(x-x1)^2 + \frac{1}{(6\cdot h2)}\cdot(Y2[2]-Y1[2])\cdot(x-x1)^3$

$$S2(x) := 1.364285714 - 0.0821428570\,x - 0.7232142860\,(x-2)^2 + 0.5053571430\,(x-2)^3 \quad (50)$$

>

> $S3(x) := y2 + Y2[1]\cdot(x-x2) + \frac{Y2[2]}{2}\cdot(x-x2)^2 + \frac{1}{(6\cdot h3)}\cdot(Y3[2]-Y2[2])\cdot(x-x2)^3$

$$S3(x) := 37.71428571 - 12.27142857\,x + 0.7928571430\,(x-3)^2 + 11.87857143\,(x-3)^3 \quad \textbf{(51)}$$

>

> $S4(x) := y3 + Y3[1]\cdot(x-x3) + \frac{Y3[2]}{2}\cdot(x-x3)^2 + \frac{1}{(6\cdot h4)}\cdot(Y4[2]-Y3[2])\cdot(x-x3)^3$

$$S4(x) := 97.64285716 - 24.08571429\,x + \frac{255}{7}\,(x-4)^2 - \frac{85}{7}\,(x-4)^3 \quad \textbf{(52)}$$

>

>

>

Resposta da letra e temos que 70 *dias corresposnde a x entre*$[x1, x2]$ *temos que* 70 *dias corresponde a x* $= 2.3$

>

> $x := 2.3$:

> $S2(x)$;

$$1.123912500 \quad \textbf{(53)}$$

Resposta da letra e temos que 100 *dias corresposnde a x entre*$[x1,$ $x2]$ *temos que* 100 *dias corresponde a* $x = 3.3$

>

> $x := 3.3$:

> $S3(x)$;

$$-2.389350000 \quad \textbf{(54)}$$

>

(55)

>