

# E10 - ANN

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## 1 Spline natural - Implementação

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import numpy as np

Xi = [i/10 for i in range(0, 35, 5)]
Yi = [1.94, 1.69, 2.17, 2.55, 1.25, 1.69, 1.28]
grau = len(Xi)

Hi = []
for i in range(grau-1): Hi.append(Xi[i + 1] - Xi[i])

diag_Hi = [[0 for i in range(grau)] for j in range(grau)]
diag_Hi[0][0], diag_Hi[-1][-1] = 1,1
for i in range(1, grau - 1):
    for j in range(grau):
        if j == (i - 1):
            diag_Hi[i][j] = Hi[i]
        elif j == i:
            diag_Hi[i][j] = 2 * (Hi[j-1] + Hi[(j)])
        elif j == (i + 1):
            diag_Hi[i][j] = Hi[i]

Ai = [0 for i in range(grau)]
for i in range(1, grau - 1):
    Ai[i] = (3 / Hi[i]) * (Yi[i + 1] - Yi[i]) - (3 / Hi[i - 1]) * (Yi[i] - Yi[i - 1])

Ci = np.linalg.solve(diag_Hi, Ai)
Di = [0 for i in range(grau)]
for i in range(len(Ci) - 1):
    Di[i] = (Ci[i + 1] - Ci[i]) / (3 * Hi[i])

Bi = [0 for i in range(grau)]
for i in range(len(Ci) - 1):
    Bi[i] = ((Yi[i + 1] - Yi[i]) / Hi[i]) - (Hi[i] / 3 * (Ci[i + 1] + 2 * Ci[i]))
```

## 2 Resposta

$a_0$  a  $a_5$

$a_3 = 2.550000000000000$   
 $a_4 = 1.250000000000000$   
 $a_2 = 2.170000000000000$   
 $a_1 = 1.690000000000000$   
 $a_0 = 1.940000000000000$   
 $a_5 = 1.690000000000000$

$b_0$  a  $b_5$

$b_1 = 0.141846153846154$   
 $b_2 = 1.633538461538461$   
 $b_4 = -1.089538461538461$   
 $b_3 = -1.516000000000000$   
 $b_0 = -0.820923076923077$   
 $b_5 = 0.714153846153846$

$c_0$  a  $c_5$

$c_2 = 1.057846153846153$   
 $c_4 = 8.209846153846152$   
 $c_0 = 0.000000000000000$   
 $c_3 = -7.356923076923076$   
 $c_5 = -4.602461538461537$   
 $c_1 = 1.925538461538462$

$d_0$  a  $d_5$

$d_4 = -8.541538461538460$   
 $d_0 = 1.283692307692308$   
 $d_1 = -0.578461538461539$   
 $d_2 = -5.609846153846153$   
 $d_5 = 3.068307692307692$   
 $d_3 = 10.377846153846152$