Example 6-7: Quadratic splines

Use quadratic splines interpolation with the following data and calculate the output power of the windmill at 24mph and 35mph windspeeds:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Windspeed (mph)** | 14 | 22 | 30 | 38 | 46 |
| **Output Power (W)** | 320 | 490 | 540 | 500 | 480 |

5 points = 4 splines i = 1..4

a1=0 because i=1 has no previous value

|  |
| --- |
| **b1 c1 a2 b2 c2 a3 b3 c3 a4 b4 c4**  **f1(x)** | 14 1 0 0 0 0 0 0 0 0 0 | | b1 | | 320 |  **f1(x)** | 22 1 0 0 0 0 0 0 0 0 0 | | c1 | | 490 |  **f2(x)** | 0 0 484 22 1 0 0 0 0 0 0 | | a2 | | 490 |  **f2(x)** | 0 0 900 30 1 0 0 0 0 0 0 | | b2 | | 540 |  **f3(x)** | 0 0 0 0 0 900 30 1 0 0 0 | | c2 | | 540 |  **f3(x)** | 0 0 0 0 0 1296 36 1 0 0 0 | | a3 | = | 500 |  **f4(x)** | 0 0 0 0 0 0 0 0 1296 36 1 | | b3 | | 500 |  **f4(x)** | 0 0 0 0 0 0 0 0 2116 46 1 | | c3 | | 460 |  **f’(x2)** | -1 0 44 1 0 0 0 0 0 0 0 | | a4 | | 0 |  **f’(x3)** | 0 0 -60 -1 0 60 1 0 0 0 0 | | b4 | | 0 |  **f’(x4)** | 0 0 0 0 0 -76 -1 0 76 1 0 | | c4 | | 0 | |

Population of

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Year** | 1960 | 1970 | 1980 | 1990 | 2000 | 2010 |
| **Population (millions)** | 1.1 | 1.4 | 1.9 | 2.1 | 2.8 | 4 |

f2(1990) - 4(f(2000)) + 3(8(2010)) / (f(2020) - f(2000)) / (2020 - 2000)

= 2.1 - 4(2.8) + 3(4) / 2(10)

= 0.145 = 0.145 M / year