Exercițiul 3

Folosind „Metoda lui Fibonacci", găsiți valoarea x care minimizează funcția: $f(x) = x^4 - 14x^3 + 60x^2 - 70x$ în intervalul $[0,2]$ cu o precizie $\varepsilon = 0,3$

$[a_1, b_1] = [0,2]$

$F_n > \frac{b_1 - a_1}{\varepsilon} = 6.66$

Se alege $F_n = 8 \Rightarrow n = 5$; $F_0\ F_1\ F_2\ F_3\ F_4\ F_5$
$1, 1, 2, 3, 5, 8$

$\lambda_1 = a_1 + \frac{F_3}{F_5}(b_1 - a_1) = 0.75$

$\mu_1 = a_1 + \frac{F_4}{F_5}(b_1 - a_1) = 1.25$

$f(\mu_1) = f(1.25) = -18.6$
$f(\lambda_1) = f(0.75) = -24.3$ $\Big\} \Rightarrow f(\lambda_1) < f(\mu_1) \Rightarrow [a_2, b_2] = [a_1, \mu_1]$

$[a_2, b_2] = [0, 1.25]$

$\lambda_2 = a_2 + \frac{F_2}{F_4}(\mu_2 - a_2) = \frac{2}{5} \cdot \frac{5}{4} = \frac{1}{2}$

$\mu_2 = \lambda_1 = 0.75$

$f(\mu_2) = f(0.75) = -24.3$
$f(\lambda_2) = f(0.5) = -21.68$ $\Big\} \Rightarrow f(\lambda_2) > f(\mu_2)$

$[a_3, b_3] = [\lambda_2, b_2] = [0.5, 1.25]$

$\lambda_3 = \mu_2 = 0.75$

$\mu_3 = a_3 + \frac{F_2}{F_3}(b_3 - a_3) = \frac{1}{2} + \frac{2}{3}\left(\frac{5}{4} - \frac{2}{4}\right) = 1$

$f(\lambda_3) = -24.3$

$f(\mu_3) = -23$

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$f(\mu_3) > f(\lambda_3) \Rightarrow [a_4, b_4] = [a_3, \mu_3] = [0{,}5, 1]$

$\lambda_4 = a_4 + \frac{F_0}{F_2}(b_4 - a_4) = \frac{1}{2} + \frac{1}{2} \cdot \frac{1}{2} = \frac{3}{4}.$

$\mu_4 = \lambda_3 = 0{,}75.$

$f(\lambda_4) = f(\mu_4) \Rightarrow (a_5, b_5] = [a_4, \mu_4] = [0{,}5, 0{,}75]$

$[b_5 - a_5] < \varepsilon \Rightarrow$ STOP.

$\Rightarrow X_{min} = \frac{a_5 + b_5}{2} = \frac{0{,}5 + 0{,}75}{2} = 0{,}625$