

Kolokwium Metody Numeryczne
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Zad

Radek Tarczak 4G

Zadanie 1

$$Q = R \cdot I^2 \cdot t$$

Narunek: $R = 100 \Omega$, $I = 0,1 A$, $t = 60 s$

$$\delta Q \leq 0,9\%$$

$$\Delta R = ?, \Delta I = ?, \Delta t = ?$$

$$\delta Q = \delta R + 2 \cdot \delta I + \delta t$$

$$\delta R + 2 \cdot \delta I + \delta t \leq 0,9\%$$

Zasada równego wpływu:

$$\delta R \leq 0,3\%$$

$$2 \delta I \leq 0,3\%$$

$$\delta t \leq 0,3\%$$

$$\delta I \leq 0,15\%$$

Zadanie 2 Radosław Tarczak 4G

x_j	y_j	$N(x_j)$	$\varphi_0(x_j)$	$\varphi_1(x_j)$
-1	0	4	1	-1
0	1	3	1	0
1	2	2	1	1
2	2	1	1	2

$$N(x) = 3 - x$$

Funkcja liniowa:

$$a_0 + a_1 x$$

$$F_0 = 4 \cdot 0 \cdot 1 + 3 \cdot 1 \cdot 1 + 2 \cdot 2 \cdot 1 + 1 \cdot 2 \cdot 1 = 3 + 4 + 2 + 1 = 10$$

$$F_1 = 4 \cdot 0 \cdot (-1) + 3 \cdot 1 \cdot 0 + 2 \cdot 2 \cdot 1 + 1 \cdot 2 \cdot 2 = -4 + 0 + 4 + 2 = 2$$

$$F = \begin{bmatrix} 10 \\ 2 \end{bmatrix}$$

$$d_{00} = 4 \cdot 1 \cdot 1 + 3 + 2 + 1 = 10$$

$$d_{10} = d_{01} = -4 + 0 + 2 + 2 = 0$$

$$d_{11} = 4 + 0 + 2 + 4 = 10$$

$$\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix} \cdot \begin{bmatrix} a_0 \\ a_1 \end{bmatrix} = \begin{bmatrix} 10 \\ 2 \end{bmatrix} \quad a_0 = \frac{9}{10} \\ a_1 = \frac{8}{10}$$

$$F(x) = \frac{9}{10} + \frac{8}{10}x = \frac{9}{10} + \frac{4}{5}x$$

Zadanie 3 Radosław Tarczak 4G

$$\int_0^4 (x^2 - x + 1) dx$$

według trapozów

$$n = 1 \quad k = 4 \quad m = k \cdot n = 4$$

$$a = 0 \quad b = 4 \quad \Delta x = 1$$

$$r = 2$$

x_i^o	0	1	2	3	4
f_i^o	1	1	3	7	13
\bar{f}_i	1	2	2	2	1

$$I = \frac{\Delta x}{n} \sum_{i=0}^n \bar{f}_i \cdot f_i^o =$$

$$= \frac{1}{2} \cdot (1+2+6+14+13) = \frac{1}{2} \cdot 36 = 18$$

$$R \leq \frac{(b-a)^3}{12m^2} \cdot M$$

$$f' = 2x-1 \quad f'' = 2$$

$$M = \sup_{x \in [0,4]} |f| = 2$$

$$R \leq \frac{(b-a)^3}{12 \cdot 4^2} \cdot 2 = \frac{128}{192} \approx 0,667$$

Zadanie 4 Radosław Terlecki 4G

$$y(x) = y(x) + x^2 \quad x \in [1, 3]$$

$$y(1) = 4 \quad h = \frac{b-x_0}{n} \neq h = 1$$

löst brücke: $n = 2$

$$i = 0$$

$$n_0 = y_0 = 4 \quad x_{i+1} = x_i + h = x_i + 1$$

$$x_1 = 1 + 1 = 2$$

$$m_0 = f(x_0, n_0) = f(1, 4) = 5$$

$$k_0 = f(x_1, n_0 + h \cdot m_0) = f(2, 9) = 13$$

$$n_1 = n_0 + \frac{h}{2} \cdot (m_0 + k_0) = 4 + \frac{1}{2}(5 + 13) = 13$$

$$i = 1$$

$$n_1 = 13 \quad x_2 = 2 + 1 = 3$$

$$m_1 = f(x_1, n_1) = f(2, 13) = 17$$

$$k_1 = f(x_2, n_1 + h \cdot m_1) = f(3, 30) = 39$$

$$m_2 = n_1 + \frac{h}{2} (m_1 + k_1) = 13 + \frac{1}{2} \cdot 56 = 41$$

Projektionen nachzutragen:

(1; 4), (2; 13), (3; 41)