Числено диференциране

Като се използват формули за числено диференциране с грешка $O(h^2)$ да се попълнят празните полета в таблицата

α	$i=0$ 0	$i=1$ 0.1	$i=2$ 0.2	$i=3$ 0.3	$i=4$ 0.4	$i=5$ 0.5	=> h = 0.1
y(α)	-0.2	0.2	0.5	0.7	0.87	1	
$y'(\alpha)$	4.5	3.5	2.5	1.85	1.5	5.9	
$y''(\alpha)$	X	-10	10	-3	-4	X	

$y_2'' = \frac{y_1 - 2 y_2 + y_3}{h^2}$

$10 = \frac{0.2 - 2 * 0.5 + y_3}{0.1^2}$

$10 = \frac{0.2 - 1 + y_3}{0.01}$ | * 0.01

$0.1 = 0.2 - 1 + y_3$

$-y_3 = 0.2 - 1 - 0.1$

$y_3 = 0.7$

$y_2' = \frac{y_3 - y_1}{2 h}$

$y_2' = \frac{0.7 - 0.2}{2 * 0.1}$

$y_2' = \frac{0.5}{0.2}$

$y_2' = 2.5$

$y_4' = \frac{y_5 - y_3}{2 h}$

$y_4' = \frac{1 - 0.7}{2 * 0.1}$

$y_4' = \frac{0.3}{0.2}$

$y_4' = 1.5$

$y_4' = \frac{y_2 - 4 y_3 + 3 y_4}{2 h}$

$1.5 = \frac{0.5 - 4 * 0.7 + 3 y_4}{2 * 0.1}$

$1.5 = \frac{0.5 - 2.8 + 3 y_4}{0.2}$

$0.3 = 0.5 - 2.8 + 3 y_4$

$- 3 y_4 = 0.5 - 2.8 - 0.3$

$- 3 y_4 = -2.6 / (-3)$

$y_4 = 0.87$

$y_2' = \frac{y_0 - 4 y_1 + 3 y_2}{2 h}$

$2.5 = \frac{y_0 - 4 * 0.2 + 3 * 0.5}{0.2}$

$0.5 = y_0 - 0.8 + 1.5$

$-y_0 = -0.8 + 1.5 - 0.5$

$- y_0 = 0.2$

$y_0 = -0.2$

$$y_0' = \frac{-3\,y_0 + 4\,y_1 - y_2}{2\,h}$$

$$y_0' = \frac{-3*(-0.2) + 4*0.2 - 0.5}{0.2}$$

$$y_0' = \frac{0.6 + 0.8 - 0.5}{0.2}$$

$$y_0' = \frac{0.9}{0.2}$$

$$y_0' = 4.5$$

$$y_1' = \frac{y_2 - y_0}{2\,h}$$

$$y_1' = \frac{0.5 - (-0.2)}{0.2}$$

$$y_1' = \frac{0.7}{0.2}$$

$$y_1' = 3.5$$

$$y_3' = \frac{y_4 - y_2}{2\,h}$$

$$y_3' = \frac{0.87 - 0.5}{0.2}$$

$$y_3' = \frac{0.37}{0.2}$$

$$y_3' = 1.85$$

$$y_5' = \frac{y_3 - 4\,y_4 + 3\,y_5}{2\,h}$$

$$y_5' = \frac{0.7 - 4*0.87 + 3*1}{0.2}$$

$$y_5' = \frac{0.7 - 4*0.87 + 3*1}{0.2}$$

$$y_5' = \frac{0.7 - 3.48 + 3}{0.2}$$

$$y_5' = \frac{1.18}{0.2}$$

$$y_5' = 5.9$$

$$y_1'' = \frac{y_0 - 2\,y_1 + y_2}{h^2}$$

$$y_1'' = \frac{-0.2 - 2*0.2 + 0.5}{0.01}$$

$$y_1'' = \frac{-0.2 - 0.4 + 0.5}{0.01}$$

$$y_1'' = \frac{-0.1}{0.01}$$

$$y_1'' = -10$$

$$y_3'' = \frac{y_2 - 2\,y_3 + y_4}{h^2}$$

$$y_3'' = \frac{0.5 - 2*0.7 + 0.87}{0.01}$$

$$y_3'' = \frac{0.5 - 2*0.7 + 0.87}{0.01}$$

$$y_3'' = \frac{0.5 - 1.4 + 0.87}{0.01}$$

$$y_3'' = \frac{-0.03}{0.01}$$

$$y_3'' = -3$$

$$y_4'' = \frac{y_3 - 2\,y_4 + y_5}{h^2}$$

$$y_4'' = \frac{0.7 - 2*0.87 + 1}{0.01}$$

$$y_4'' = \frac{0.7 - 1.74 + 1}{0.01}$$

$$y_4'' = \frac{-0.04}{0.01}$$

$$y_4'' = -4$$