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Halaman I

2 $\frac{dy}{dx} = 5x^2 + 2x - 5y, \quad y(0) = \frac{1}{3} \qquad h = 0,1$

$f(x,y) = 5x^2 + 2x - 5y$

a)

$k_1 = f(x_0, y_0) = 5(0)^2 + 2(0) - 5\left(\frac{1}{3}\right) = -1,667$

$k_2 = f\left(x_0 + \frac{0,1}{2}, y_0 + \frac{-1,667(0,1)}{2}\right) = 5\left(0+\frac{0,1}{2}\right)^2 + 2\left(0+\frac{0,1}{2}\right) - 5\left(\frac{1}{3} + \frac{-1,67}{2}.0,1\right) = -1,1375$

$k_3 = f\left(x_0 + \frac{0,1}{2}, y_0 + \frac{-1,1375}{2}.0,1\right) = 5\left(0+\frac{0,1}{2}\right)^2 + 2\left(0+\frac{0,1}{2}\right) - 5\left(\frac{1}{3} + \frac{-1,138}{2}.0,1\right) = -1,27$

$k_4 = f(x_0 + 0,1, y_0 + (-1,27).0,1) = 5(0+0,1)^2 + 2(0+0,1) - 5((-1,27)0,1 + \frac{1}{3}) = -0,78$

$y_1 = \frac{1}{3} + \frac{0,1}{6}(-1,667 - (1,1375 + 1,27)2 - 0,78) = 0,212$

$k_1 = f(0,1, 0,212) = -0,81$

$k_2 = f\left(0.1 + \frac{0.1}{2}, 0,212 + \frac{-0,81}{2}(0,1)\right) = -0,45$

$k_3 = f\left(0,1 + \frac{0,1}{2}, 0.212 + \frac{-0,45}{2}.0,1\right) = -0,54$

$k_4 = f(0.1+0.1, 0.212 + (-0,54)0,1) = -0,19$

$y_2 = 0.212 + \frac{0.1}{6}(-0,81 - 2(0,45+0,54) - 0,19) = 0,1627$

$k_1 = f(0.2, 0.1627) = -0.214$

$k_2 = f\left(0.2 + \frac{0.1}{2}, 0.1627 + \frac{-0.214}{2}.(0,1)\right) = 0,052$

$k_3 = f\left(0.2 + \frac{0.1}{2}, 0.1627 + \frac{0,052}{2}.(0.1)\right) = -0,014$

$k_4 = f\left(0.2+0.1, 0.1627 + \frac{-0.014}{2}(0.1)\right) = 0,243$

$y_3 = 0.1627 + \frac{0.1}{6}(-0.214 + 2(0.052 - 0.014) + 0.243 = 0.1645$

b) $y(0.3) = (0.3)^2 + \frac{1}{3}e^{-5(0.3)} = 0.1644$

$E_t = (-y_3) + y(0.3) = 0.1645 - 0.1644 = -0.0001$

$|\epsilon_t|\% = \left|\frac{E_t}{y(0.3)}\right| \times 100\% = \left|\frac{-0.0001}{0.1644}\right| \times 100\% = 0,085\%$

Semua hitungan menggunakan tabel excel

1)

i	x_i	$f(x_i)$	∇f	$\nabla^2 f$
0	4	8.1	4.1	4
1	6	12.2	8.1	4
2	8	20.3	12.1	
3	10	32.4		

$x = 5$

$s = \frac{x - x_0}{h} = \frac{5-4}{2} = 0{,}5$

a. $P_2(x) = f_0 + s\Delta f_0 + \frac{s(s-1)}{2}\Delta^2 f_0$

$= 8{,}1 + s.(4{,}1) + (s^2 - s)\frac{4}{2}$

$= 8{,}1 + 4{,}1s + 2s^2 - 2s$

$= 8{,}1 + 2{,}1s + 2s^2$

b. $P_2(5) = 8{,}1 + 2{,}1(0{,}5) + 2(0{,}5)^2$

$= 8{,}1 + 1{,}05 + 0{,}5$

$= 9{,}65$

c. $f'(x) = \frac{-3f(x) + 4(x+h) - f(x+2h)}{2h} + O(h^2)$

rumus di atas dari $4f(x+h) - f(x+2h)$

$f'(4) = \frac{-3f(4) + 4f(6) - f(8)}{2 \times 2}$

$= \frac{-3(8{,}1) + 4(12{,}2) - 20{,}3}{4}$

$= 1{,}05$