152120211104 - Doğukan Kuşkuk

Q1

$$f'(x_i) = \frac{f(x_{i+h}) - f(x_i)}{h}$$

$$f'(0) = \frac{f(0,5) - f(0)}{0,5} \Rightarrow -1,5$$

$$f'(0,5) = \frac{f(1) - f(0,5)}{0,5} \Rightarrow -0,5$$

$$f'(1) = \frac{f(1,5) - f(1)}{0,5} \Rightarrow 0,5$$

$$f'(1,5) = \frac{f(2) - f(1,5)}{0,5} \Rightarrow 1,5$$

Q2

$$y_{i+h} = y_i + f(x_i, y_i).h \qquad x_0 = 0 \;,\; y_0 = 1$$

$$y_{0,5} = y_0 + f(x_0, y_0).0,5 \Rightarrow y_{0,5} = 1$$

$$y_1 = y_{0,5} + f(0,5, 1).0,5 \Rightarrow y_1 = 1,375$$

$$y_{1,5} = y_1 + f(1, 1,375) \Rightarrow y_{1,5} = 1,6875$$

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Q3

Predictor $\Rightarrow y^*_{i+1} = y_i + f(x_i, y_i)h$

Corrector $\Rightarrow y_{i+1} = y_i + \frac{f(x_i,y_i) + f(x_{i+1}, y^*_{i+1})}{2} . h$

$x_0 = 0$
$y_0 = 1$
$h = 0,5$

$y' = 2x - y.x^2$

$y^*_{(0,5)} = y_0 + f(x_0, y_0).h \Rightarrow y^*_{(0,5)} = 1$

$y_{(0,5)} = y_0 + \frac{h}{2} . \left(f(x_0,y_0) + f(x_{0,5}, y^*_{0,5})\right) \Rightarrow 1,1875$

$y^*_1 = y_{0,5} + f(x_{0,5}, y_{0,5}).h \Rightarrow 1,53$

$y_1 = y_{0,5} + \frac{h}{2} . \left(f(x_{0,5}, y_{0,5}) + f(x_1, y^*_1)\right) \Rightarrow 1,485$

$y^*_{1,5} = y_1 + f(x_1, y_1).h \Rightarrow 1.74$

$y_{1,5} = y_1 + \frac{h}{2} . \left(f(x_1, y_1) + f(x_{1,5}, y^*_{1,5})\right) = 1,645$