Syed Ali Hassan
Bscs 118/3-14/MSS

Q Given $y' = \frac{y-x}{y+x}$ with $y_0 = 1$ find y for $x = 0.1$ in four steps Euler's Method.

Solution:

So let $h = \frac{0.1}{4} = 0.025$ given $y_0 = 1$

where $x = 0$

we know that;

$$y_{n+1} = y_n + hf(x_n, y_n)$$

By putting $n = 0, 1, 2, 3$, we obtain

$$y_1 = y_0 + hf(x_0, y_0)$$

$$= 1 + 0.025 \frac{(1-0)}{(1+0)} = 1.025$$

$$y_1 = 1.025$$

Again $y_2 = y_1 + hf(x_1, y_1)$

$$= 1.025 + 0.025 \frac{(1.025 - 0.25)}{(1.025 + 0.025)}$$

(where $x_1 = x_0 + h = 0 + 0.025$

$\Rightarrow x_1 = 0.025$)

$$= 1.0488$$

$$y_2 = 1.0488$$

Now again, $y_3 = y_2 + hf(x_2, y_2)$

(where $x_2 = x_0 + 2h = 0 + 1 \times 0.025 = 0.05$)

$$= 1.0488 + 0.025 \frac{(1.0488 - 0.05)}{(1.0488 + 0.05)}$$

$$= 1.07152$$

$y_3 = 1.07152$

$y_4 = y_3 + hf(x_3, y_3)$ where $x_0 + 3h$

$= 0 + 3 \times 0.025$

$= 0.075$

$= 1.07152 + 0.025 \frac{(1.07152 - 0.075)}{(1.07152 + 0.073)}$

$y_4 = 1.09324$ at $(x_4 = x_0 + 4h = 0 + 4 \times 0.025$

$= 0.1)$

~~$y_4 = 1.09...$~~ Hence,

$y(0.1) = 1.0932$