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0. $x = 0 \rightarrow y = 1$ $x = 0,5$

$h = 0,25$

$y_{i+1} = y_i + f(x_i, y_i) \cdot h$

$= 1 + f(0,1) \cdot 0,25$

$= 1 + 0\sqrt{1} \cdot 0,25$

$= 1$

$y_{i+1} = y_i + f(x_i, y_i) h$

$= 1 + f(0,25, 1) 0,25$

$= 1 + 0,25\sqrt{1} \cdot 0,25$

$= 1,0625$

$x = 0,75$

$y_{i+1} = y_i + f(x_i, y_i) \cdot h$

$= 1,0625 + f(0,5, 1,0625)\, 0,25$

$= 1,0625 + 0,5\sqrt{1,0625} \cdot 0,25$

$= 1,1914$

$x = 1$

$y_{i+1} = y_i + f(x_i, y_i) h$

$= 1,1914 + f(0,75, 1,1914), 0,25$

$= 1,1914 + 0,75\sqrt{1,1914} \times 0,25$

$= 1,3961$

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x	y
0	1
0,25	1
0,5	1,0625
0,75	1,1914
1	1,3961

nilai eksak :

$\frac{dy}{dx} = x\sqrt{y} \rightarrow dy = x\sqrt{y}\,.\,dx$

$\frac{dy}{\sqrt{y}} - x\,dx = 0$

$y^{-1/2}\,dy - x\,dx = 0$

$\int y^{-1/2}\,dy - \int x\,dx = 0$

$2\sqrt{y} - \frac{1}{2}x^2 = C$

Pada saat $x = 0$; $y = 1$

$2\sqrt{1} - \frac{1}{2}(0)^2 = C \rightarrow C = 2$

- Persamaan

$2\sqrt{y} - \frac{1}{2}x^2 = 2$

$x = 0,25$

$2\sqrt{y} - \frac{1}{2}(0,25)^2 = 2$

$2\sqrt{y} = 2,0325$

$\sqrt{y} = 1,015625$

$y = 1,0315$

$x = 0,5$

$2\sqrt{2} - \frac{1}{2}(0,5)^2 = 2$

$\sqrt{y} = 1,0625$

$y = 1,1289$

$x = 0,75$

$2\sqrt{y} - \frac{1}{2}(0,75)^2 = 2$

$\sqrt{y} = 1,140625$

$y = 1,3010$

$x = 1$

$2\sqrt{y} - \frac{1}{2}(1)^2 = 2$

$\sqrt{y} = 1,25$

$y = 1,5625$

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Error :

x	y euler	y sebenarnya	ε_t
0	1	1	0%
0,25	1	1,0315	3,0578 %
0,5	1,0625	1,1289	5,8188 %
0,75	1,1914	1,3010	8,4245 %
1	1,3961	1,5625	10,6496 %

$$\varepsilon_t = \left| \frac{y_{euler} - y_{sebenarnya}}{y_{sebenarnya}} \right| \times 100\%$$

(2). $dy/dx = x + y$

$y(0) = 1$

Hitung : $y(0,10)$ Heun ($h = 0,025$)

$f(x,y) = x + y$

$a = x_0 = 0$; $b = 0,1$, $h = 0,02$

$n = (0,10 - 0)/0,02 = 5$

$x_1 = 0,02$ $y^{(0)}_1 = y_0 + hf(x_0, y_0)$

$= 1 + 0,02(0,1)$

$= 1,02$

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$y^{(1)}_1 = y_0 + (h/2)[f(x_0, y_0) + f(x_1, y^{(0)}_1)]$

$= 1 + (0,02/2)[0 + 1 + 0,02 + 1,02]$

$= 1,0204$

$x_2 = 0,04 \rightarrow y^{(0)}_2 = y_1 + hf(x_1, y_1)$

$= 1,0204 + 0,02(0,02 + 1,0204)$

$= 1,0412$

$y^{(1)}_2 = y_1 + (h/2)[f(x_1, y_1) + f(x_2, y^{(0)}_2)]$

$= 1,0204 + (0,02/2)[0,02 + 1,02 + 0,04 + 1,0412]$

$= 1,0411$

$x_5 = 0,10$

$y^{(0)} = y_4 + hf(x_4, y_4)$

$y^{(1)}_5 = y_4 + (h/2)[f(x_4, y_4) + f(x_5, y_5)]$

$= 1,1104$

Jadi, $y(0,10) = 1,1104$