

AshaSchwegler_S11_Aufg2

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$$\begin{aligned} \cdot y'(x) &= f(x, y(x)) = \frac{x^2}{y} & \cdot x_0 &= 0 \\ \cdot [0, x, 1, 4] & & \cdot y_0 &= 2 \\ y(0) &= 2 \end{aligned}$$

a) $h = 0.7$

$$x_1 = x_0 + h = 0 + 0.7 = \underline{0.7}$$

$$x_2 = x_1 + h = 0.7 + 0.7 = \underline{1.4}$$

$$y_1 = y_0 + h \cdot f(x_0, y_0) = 2 + 0.7 \cdot (0) = 2$$

$$y_2 = y_1 + h \cdot f(x_1, y_1) = 2 + 0.7 \cdot (0.7/2) = \underline{2.1715}$$

b) $h = 0.7$

$$h/2 = 0.35$$

$$x_{h/2} = x_i + \frac{h}{2} = x_0 + 0.35 = 0.35$$

$$y_{h/2} = y_i + \frac{h}{2} \cdot f(x_i, y_i) = 2$$

$$\cdot x_1 = 0 + 0.7 = 0.7$$

$$\cdot y_1 = 2 + 0.7 \cdot f(0.35, 2) = 2 + 0.7 \cdot \left(\frac{0.35^2}{2}\right) = 2 + 0.7 \cdot (0.06125) = 2.043$$

$$\cdot x_2 = 0.7 + 0.7 = 1.4$$

$$\cdot y_2 = 0.043 + 0.7 \cdot (0.06125) = 0.09$$

c) $h = 0.7$

$$k_1 = f(x_i, y_i) = 0$$

$$\hat{y}_{i+1} = y_i + h \cdot k_1 = 2$$

$$x_1 = x_0 + h = \underline{1.4}$$

$$k_2 = f(1.4, 2) = \frac{1.4^2}{2} = 0.98$$

$$y_1 = y_i + h \cdot \left(\frac{k_1 + k_2}{2}\right) = 2 + 0.7 \cdot (0.49) = \underline{2.343}$$

$$x_2 = 1.4 + 0.7 = 2.1$$

$$y_2 = 2.343 + 0.7 \cdot (0.98) = \underline{3.019}$$