$$y_{j+1} = y_j + h\left(1 + \frac{1}{2}\nabla + \frac{5}{12}\nabla^2 + \frac{3}{8}\nabla^3 + \frac{251}{720}\nabla^4 + \cdots\right)f_j$$

$$\begin{cases} y_1 = y_0 + hf_0 = -1 + 0.1 \times 1 = -0.9 \\ f_1 = -y_1 - 2x_1 = -(-0.9) - 2 \times 0.1 = 0.7 \\ \nabla f_1 = f_1 - f_0 = 0.7 - 1 = -0.3 \end{cases}$$

$$\begin{cases} y_2 = y_1 + h\left(f_1 + \frac{1}{2}\nabla f_1\right) \\ \quad = -0.9 + 0.1 \times \left(0.7 + \frac{1}{2} \times (-0.3)\right) \\ \quad = -0.845 \\ f_2 = -y_2 - 2x_2 = -(-0.845) - 2 \times 0.2 = 0.445 \\ \nabla f_2 = f_2 - f_1 = 0.445 - 0.7 = -0.255 \\ \nabla^2 f_2 = \nabla f_2 - \nabla f_1 = -0.255 - (-0.3) = 0.045 \end{cases}$$

$$\begin{cases} y_3 = y_2 + h\left(f_2 + \frac{1}{2}\nabla f_2 + \frac{5}{12}\nabla^2 f_2\right) \\ \quad = -0.845 + 0.1 \times \left(0.445 + \frac{1}{2} \times (-0.255) + \frac{5}{12} \times 0.045\right) \\ \quad = -0.811375 \\ f_3 = -y_3 - 2x_3 = -(-0.811375) - 2 \times 0.3 = 0.211375 \\ \nabla f_3 = f_3 - f_2 = 0.211375 - 0.445 = -0.233625 \\ \nabla^2 f_3 = \nabla f_3 - \nabla f_2 = -0.233625 - (-0.255) = 0.021375 \\ \nabla^3 f_3 = \nabla^2 f_3 - \nabla^2 f_2 = 0.021375 - 0.045 = -0.023625 \end{cases}$$

$$y_4 = y_3 + h\left(f_3 + \frac{1}{2}\nabla f_3 + \frac{5}{12}\nabla^2 f_3 + \frac{3}{8}\nabla^3 f_3\right)$$

$$= -0.811375 + 0.1 \times \left[0.211375 + \frac{1}{2} \times (-0.233625)\right.$$

$$\left. + \frac{5}{12} \times 0.021375 + \frac{3}{8} \times (-0.023625)\right]$$

$$= -0.8019140625$$

$$f_4 = -y_4 - 2x_4 = -(-0.8019140625) - 2 \times 0.4$$

$$= 1.9140625 \times 10^{-3}$$

$$\nabla f_4 = f_4 - f_3 = 1.9140625 \times 10^{-3} - 0.211375$$

$$= -0.2094609375$$

$$\nabla^2 f_4 = \nabla f_4 - \nabla f_3 = -0.2094609375 - (-0.233625)$$

$$= 0.0241640625$$

$$\nabla^3 f_4 = \nabla^2 f_4 - \nabla^2 f_3 = 0.0241640625 - 0.021375$$

$$= 2.7890625 \times 10^{-3}$$

$$\nabla^4 f_4 = \nabla^3 f_4 - \nabla^3 f_3 = 2.7890625 \times 10^{-3} - (-0.023625)$$

$$= 0.0264140625$$

$$y_5 = y_4 + h\left(f_4 + \frac{1}{2}\nabla f_4 + \frac{5}{12}\nabla^2 f_4 + \frac{3}{8}\nabla^3 f_4 + \frac{251}{720}\nabla^4 f_4\right)$$

$$= -0.8019140625 + 0.1 \times \left[1.9140625 \times 10^{-3}\right.$$

$$+ \frac{1}{2} \times (-0.2094609375) + \frac{5}{12} \times 0.0241640625$$

$$\left. + \frac{3}{8} \times 2.7890625 \times 10^{-3} + \frac{251}{720} \times 0.0264140625\right]$$

$$= -0.8101634538$$