

①

X	0	0.25	0.5	0.75	1.0
Y	1	1.28	1.68	2.12	2.72

a)

$$\begin{bmatrix} n & \sum x_i & \sum x_i^2 \\ \sum x_i & \sum x_i^2 & \sum x_i^3 \\ \sum x_i^2 & \sum x_i^3 & \sum x_i^4 \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} \sum y_i \\ \sum x_i y_i \\ \sum x_i^2 y_i \end{bmatrix}$$

$$\begin{bmatrix} 5 & 2.5 & 1.875 \\ 2.5 & 1.875 & 1.5625 \\ 1.875 & 1.5625 & 1.3828 \end{bmatrix} \begin{bmatrix} a_0 \\ a_1 \\ a_2 \end{bmatrix} = \begin{bmatrix} 8.8 \\ 5.47 \\ 4.4125 \end{bmatrix}$$

SoR  $\omega = 1.2$   $q^{(0)} = 0$

Iterasi 1

$$a_0 = (1 - 1.2) \times 0 + \frac{1.2}{5} [8.8 - 2.5(0) - 1.875(0)] = 2.112$$

$$a_1 = (1 - 1.2) \times 0 + \frac{1.2}{1.875} [5.47 - 2.5(2.112) - 1.5625(0)] = 0.1216$$

$$a_2 = (1 - 1.2) \times 0 + \frac{1.2}{1.3828} [4.4125 - 1.875(2.112) - 1.5625(0.1216)] = 0.2278$$

Iterasi 2

$$a_0 = -0.2 \times 2.112 + \frac{1.2}{5} [8.8 - 2.5(0.1216) - 1.875(0.2278)] = 1.514$$

$$a_1 = -0.2 \times 0.1216 + \frac{1.2}{1.875} [5.47 - 2.5(1.514) - 1.5625(0.2278)] = 0.826$$

$$a_2 = -0.2 \times 0.2278 + \frac{1.2}{1.3828} [4.4125 - 1.875(1.514) - 1.5625(0.826)] = 0.2$$

Iterasi 3

$$a_0 = -0.2 \times 1.514 + \frac{1.2}{5} [8.8 - 2.5(0.826) - 1.875(0.2)] = 1.2236$$

$$a_1 = -0.2 \times 0.826 + \frac{1.2}{1.875} [5.47 - 2.5(1.2236) - 1.5625(0.2)] = 1.1778$$

$$a_2 = -0.2 \times 0.2 + \frac{1.2}{1.3828} [4.4125 - 1.875(1.2236) - 1.5625(1.1778)] = 0.201$$

$$y = 1.2236 + 1.1778x + 0.201x^2$$

b)  $x = 0.6$

$$y = 1.2236 + 1.1778(0.6) + 0.201(0.6)^2$$

$$= 2.00264$$

$$② f_1 = 4x_1^3 + 2x_2^2 + 4x_1x_2 - 42x_1 = 0$$

$$① f_2 = 4x_2^3 + 2x_1^2 + 4x_1x_2 - 26x_2 - 22 = 0$$

$$J_{1,1} = \frac{\partial f_1}{\partial x_1} = 12x_1^2 + 4x_2 = 42$$

$$J_{1,2} = \frac{\partial f_1}{\partial x_2} = 4x_2 + 4x_1$$

$$J_{2,1} = \frac{\partial f_2}{\partial x_1} = 4x_1 + 4x_2$$

$$J_{2,2} = \frac{\partial f_2}{\partial x_2} = 12x_2^2 + 4x_1 - 26$$

$$J = \begin{bmatrix} 12x_1^2 + 4x_2 & 4x_2 + 4x_1 \\ 4x_1 + 4x_2 & 12x_2^2 + 4x_1 - 26 \end{bmatrix}$$

$$\begin{bmatrix} x_{n+1} \\ x_{2n+1} \end{bmatrix} = \begin{bmatrix} x_{1n} \\ x_{2n} \end{bmatrix} - \begin{bmatrix} \frac{\partial f_1}{\partial x_1} & \frac{\partial f_1}{\partial x_2} \\ \frac{\partial f_2}{\partial x_1} & \frac{\partial f_2}{\partial x_2} \end{bmatrix}^{-1} \times f \left( \begin{bmatrix} x_{1n} \\ x_{2n} \end{bmatrix} \right)$$

$$x^{(1)} = \begin{bmatrix} 1 \\ 1 \end{bmatrix} - \begin{bmatrix} -26 & 8 \\ 8 & -10 \end{bmatrix}^{-1} \times \begin{bmatrix} -32 \\ -38 \end{bmatrix}$$

$$= \begin{bmatrix} -2.1837 \\ -5.3469 \end{bmatrix}$$

$$x^{(2)} = \begin{bmatrix} -2.1837 \\ -5.3469 \end{bmatrix} - \begin{bmatrix} -6.1666 & -30.1224 \\ -30.1224 & 308.3424 \end{bmatrix}^{-1} \times \begin{bmatrix} 153.9469 \\ -438.2055 \end{bmatrix}$$

$$= \begin{bmatrix} 10.0168 \\ -2.7339 \end{bmatrix}$$

$$x^{(3)} = \begin{bmatrix} 10.0168 \\ -2.7339 \end{bmatrix} - \begin{bmatrix} 1151.091 & 23.1315 \\ 23.1315 & 103.7563 \end{bmatrix}^{-1} \times \begin{bmatrix} 3564.855 \\ 38.4802 \end{bmatrix}$$

$$= \begin{bmatrix} 6.9645 \\ -2.4405 \end{bmatrix}$$

$$x^{(4)} = \begin{bmatrix} 6.9645 \\ -2.4405 \end{bmatrix} - \begin{bmatrix} 530.2936 & 18.096 \\ 18.096 & 73.3329 \end{bmatrix}^{-1} \times \begin{bmatrix} 1002.613 \\ 12.3209 \end{bmatrix}$$

$$= \begin{bmatrix} 5.0635 \\ -2.1336 \end{bmatrix} //$$

b) galat relatif

$$x_1 = \left| \frac{5.0635 - 6.9645}{5.0635} \right| \times 100\% = 37.5\%$$

$$x_2 = \left| \frac{-2.1336 + 2.4405}{-2.1336} \right| \times 100\% = 14\%$$