AshaSchwegler_S3_Aufg1

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$$f_1(x_1, x_2) = 20 - 18x_1 - 2x_2^2 \qquad x^{(0)} = \begin{pmatrix} 1.1 \\ 0.9 \end{pmatrix}$$

$$f_2(x_1, x_2) = -4x_2 \cdot (x_1 - x_2^2)$$

$$f(x^{(0)}) = \begin{pmatrix} -1.42 \\ -1.044 \end{pmatrix}$$

$$Df(x_1, x_2) \begin{pmatrix} -18 & -3.6 \\ -3.6 & 5.32 \end{pmatrix}$$

$$Df(1.1, 0.9)\,\delta^{(0)} = -f(1.1, 0.9)$$

$$= \begin{pmatrix} -18 & -3.6 \\ -3.6 & 5.32 \end{pmatrix} \delta^{(0)} = -\begin{pmatrix} -1.42 \\ -1.044 \end{pmatrix}$$

$$\delta^{(0)} = \begin{pmatrix} -0.104 \\ 0.12583 \end{pmatrix}$$

$$x^{(1)} = x^{(0)} + \delta^{(0)}$$

$$= x^{(1)} = \begin{pmatrix} 1.1 \\ 0.9 \end{pmatrix} + \begin{pmatrix} -0.104 \\ 0.12583 \end{pmatrix} = \begin{pmatrix} 0.996 \\ 1.026 \end{pmatrix}$$

$$\| f(x^{(1)}) \|_2 = \| f(0.996, 1.026) \|_2 = 1.7625$$

$$\| f(x^{(1)} - x^{(0)} \|_2 = \| (0.996, 1.026) - (1.1, 0.9) \|_2 = 0.1633$$

$$Df(x^{(1)}) = \begin{pmatrix} -18 & -4.104 \\ -4.104 & 8.6481 \end{pmatrix}$$

$$Df(0.996, 1.026) \cdot \delta^{(1)} = -f(0.996, 1.026)$$

$$\begin{pmatrix} -18 & -4.104 \\ -4.104 & -2.352 \end{pmatrix} \delta^{(1)} = -\begin{pmatrix} -1.42 \\ -1.044 \end{pmatrix}$$

$$\delta^{(1)} = \begin{pmatrix} 0.0039 \\ -0.0251 \end{pmatrix}$$

$$x^{(2)} = x^{(1)} + \delta^{(1)}$$

$$x^{(2)} = \begin{pmatrix} 0.996 \\ 1.026 \end{pmatrix} + \begin{pmatrix} 0.0039 \\ -0.0251 \end{pmatrix} = \begin{pmatrix} 1.104 \\ 0.875 \end{pmatrix}$$

$$\|F(x^{(2)})\|_2 = \|F(1.104, 0.875)\|_2 = 1.836$$

$$\|x^{(2)} - x^{(1)}\|_2 = 0.1855$$