

# AshaSchwegler\_S2\_Aufg1

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$$a) p(x_1, x_2) = \begin{pmatrix} 5x_1x_2 \\ x_1^2x_2^2 + x_1 + 2x_2 \end{pmatrix}, \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \end{pmatrix}$$

$$Df(x_1, x_2) = \begin{pmatrix} 5x_2 & 5x_1 \\ 2x_1x_2^2 + 1 & 2x_2x_1^2 + 2 \end{pmatrix}$$

$$Df(x_1, x_2) = \begin{pmatrix} 10 & 5 \\ 9 & 6 \end{pmatrix}$$

$$b) f(x_1, x_2, x_3) = \begin{pmatrix} \ln(x_1^2 + x_2^2) + x_3^2 \\ \exp(x_2^2 + x_3^2) + x_1^2 \\ \frac{1}{(x_3^2 + x_1^2)} + x_2^2 \end{pmatrix}, \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$$

$$Df(x_1, x_2, x_3) = \begin{pmatrix} \frac{2x_1}{x_1^2 + x_2^2} & \frac{2x_2}{x_1^2 + x_2^2} & 2x_3 \\ 2x_1 & 2x_2 e^{x_2^2 + x_3^2} & 2x_3 e^{x_2^2 + x_3^2} \\ \frac{2x_1}{(x_1^2 + x_3^2)^2} & 1 & -\frac{2x_3}{(x_1^2 + x_3^2)^2} \end{pmatrix}$$

$$Df(x_1, x_2, x_3) = \begin{pmatrix} \frac{2}{5} & \frac{4}{5} & 6 \\ 2 & 4e^{13} & 6e^{13} \\ \frac{2}{100} & 1 & -\frac{6}{100} \end{pmatrix}$$