

# Abgabe - Übungsblatt [11]

Angewandte Mathematik: Numerik

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## Aufgabe 1

Here comes your text ...

## Aufgabe 2

And some more text ...

## Aufgabe 3

And even more text ...

## Aufgabe 4

a)

$$\begin{aligned} f &= \begin{pmatrix} (R + r \cos \varphi) \cos \theta \\ (R + r \cos \varphi) \sin \theta \\ r \sin \varphi \end{pmatrix} \\ \frac{\delta}{\delta \theta} f &= \begin{pmatrix} (R + r \cos \varphi)(-\sin \theta) \\ (R + r \cos \varphi)(\cos \theta) \\ 0 \end{pmatrix} \\ \frac{\delta}{\delta \varphi} f &= \begin{pmatrix} -r \cos \theta \sin \varphi \\ -r \sin \theta \sin \varphi \\ r \cos \varphi \end{pmatrix} \\ f' &= \begin{pmatrix} (R + r \cos \varphi)(-\sin \theta) & -r \cos \theta \sin \varphi \\ (R + r \cos \varphi)(\cos \theta) & -r \sin \theta \sin \varphi \\ 0 & r \cos \varphi \end{pmatrix} \end{aligned}$$

b)

$$\begin{aligned}
(f \circ \gamma)' &= f'(\gamma(t)) \circ \gamma'(t) \\
&= \begin{pmatrix} (R + r \cos(bt^2))(-\sin(at^2)) & -r \cos(at^2) \sin(bt^2) \\ (R + r \cos(bt^2))(\cos(at^2)) & -r \sin(at^2) \sin(bt^2) \\ 0 & r \cos(bt^2) \end{pmatrix} \circ \begin{pmatrix} 2at \\ 2bt \end{pmatrix} \\
&= \begin{pmatrix} 2at(R + r \cos(bt^2))(-\sin(at^2)) + (-2btr \cos(at^2) \sin(bt^2)) \\ 2at(R + r \cos(bt^2))(\cos(at^2)) + (-2btr \sin(at^2) \sin(bt^2)) \\ 2btr \cos(bt^2) \end{pmatrix} \\
&= \begin{pmatrix} 2t(a(R + r \cos(bt^2))(-\sin(at^2)) + (-br \cos(at^2) \sin(bt^2))) \\ 2t(a(R + r \cos(bt^2))(\cos(at^2)) + (-br \sin(at^2) \sin(bt^2))) \\ 2btr \cos(bt^2) \end{pmatrix}
\end{aligned}$$