

Prof. Dr. Abhinav Sharma

Pranay Jaiswal

Tanja Schoger

Bearbeitet von Jan Claar

Aufgabe 1

a)

$$\begin{aligned}\nabla(\mathbf{r} \cdot \mathbf{k}) &= \hat{\mathbf{e}}_x \partial_x x k_x + \hat{\mathbf{e}}_y \partial_y y k_y + \hat{\mathbf{e}}_z \partial_z z k_z \\ &= \hat{\mathbf{e}}_x k_x + \hat{\mathbf{e}}_y k_y + \hat{\mathbf{e}}_z k_z \\ &= \mathbf{k}\end{aligned}$$

b)

$$\begin{aligned}\nabla \left(\frac{1}{|\mathbf{r} - \mathbf{k}|} \right) &= \nabla [(x - k_x)^2 + (y - k_y)^2 + (z - k_z)^2]^{-\frac{1}{2}} \\ &= [2(x - k_x)\hat{\mathbf{e}}_x + 2(y - k_y)\hat{\mathbf{e}}_y + 2(z - k_z)\hat{\mathbf{e}}_z] \\ &\quad \cdot \frac{-1}{2} [(x - k_x)^2 + (y - k_y)^2 + (z - k_z)^2]^{-\frac{3}{2}} \\ &= -\frac{\mathbf{r} - \mathbf{k}}{|\mathbf{r} - \mathbf{k}|^3}\end{aligned}$$