Gradiënten berekenen

De gradiënt van een potentiaal wordt gegeven door $\vec{\nabla}V(\vec{r})$:

a) $V(\vec{r}) = r^{\frac{4}{3}}$

$$\begin{aligned} \vec{\nabla} r^{\frac{4}{3}} &= \frac{4}{3} r^{\frac{1}{3}} \vec{\nabla} r \\ &= \frac{4}{3} r^{\frac{1}{3}} \hat{r} \end{aligned}$$

b) $V(\vec{r}) = x - 3y + 7z$

$$\begin{aligned} \vec{\nabla}(x - 3y + 7z) &= \frac{\partial(x-3y+7z)}{\partial x}\hat{x} + \frac{\partial(x-3y+7z)}{\partial y}\hat{y} + \frac{\partial(x-3y+7z)}{\partial z}\hat{z} \\ &= 1\hat{x} - 3\hat{y} + 7\hat{z} \end{aligned}$$

c) $V(\vec{r}) = x - 3y + 7z - 12$

$$\begin{aligned} \vec{\nabla}(x - 3y + 7z - 12) &= \frac{\partial(x-3y+7z-12)}{\partial x}\hat{x} + \frac{\partial(x-3y+7z-12)}{\partial y}\hat{y} + \frac{\partial(x-3y+7z-12)}{\partial z}\hat{z} \\ &= 1\hat{x} - 3\hat{y} + 7\hat{z} \end{aligned}$$

d) $V(\vec{r}) = e^r$

$$\begin{aligned} \vec{\nabla} e^r &= e^r \vec{\nabla} r \\ &= e^r \hat{r} \end{aligned}$$