

Define $V(\underline{r}) = \frac{q}{4\pi\epsilon_0} \frac{1}{R}$

$$\begin{aligned}\nabla\left(\frac{1}{R}\right) &= \left[\hat{x}\frac{\partial}{\partial x} + \hat{y}\frac{\partial}{\partial y} + \hat{z}\frac{\partial}{\partial z}\right]\frac{1}{R} \\ &= -\frac{1}{2} \frac{[2(x-x')\hat{x} + 2(y-y')\hat{y} + 2(z-z')\hat{z}]}{[(x-x')^2 + (y-y')^2 + (z-z')^2]^{3/2}}\end{aligned}$$

$$= -\frac{\underline{R}}{R^3}$$

$$= -\frac{\hat{R}}{R^2}$$

$$\left[\begin{array}{l} \text{NB. } x \text{ and } x' \text{ are independent!} \\ \therefore \frac{\partial x'}{\partial x} = \frac{\partial y'}{\partial y} = \frac{\partial z'}{\partial z} = 0. \end{array} \right]$$