

$$\text{rot rot } \vec{A} = \text{grad div } \vec{A} - \nabla^2 \vec{A}$$

$$\begin{aligned} \text{rot rot } \vec{A} &= \text{rot } \vec{B} = \left(\frac{\partial B_z}{\partial y} - \frac{\partial B_y}{\partial z}; -\frac{\partial B_z}{\partial x} + \frac{\partial B_x}{\partial z}; \frac{\partial B_y}{\partial x} - \frac{\partial B_x}{\partial y} \right) = \\ &= \left(\frac{\partial}{\partial y} \left(\frac{\partial A_y}{\partial x} - \frac{\partial A_x}{\partial y} \right) - \frac{\partial}{\partial z} \left(-\frac{\partial A_z}{\partial x} + \frac{\partial A_x}{\partial z} \right); -\frac{\partial}{\partial x} \left(\frac{\partial A_y}{\partial x} - \frac{\partial A_x}{\partial y} \right) + \frac{\partial}{\partial z} \left(\frac{\partial A_z}{\partial y} - \frac{\partial A_y}{\partial z} \right); \frac{\partial}{\partial x} \left(-\frac{\partial A_z}{\partial x} + \frac{\partial A_x}{\partial z} \right) - \frac{\partial}{\partial y} \left(\frac{\partial A_z}{\partial y} - \frac{\partial A_y}{\partial z} \right) \right) = \\ &= \left(\frac{\partial^2 A_y}{\partial y \partial x} - \frac{\partial^2 A_x}{\partial y^2} + \frac{\partial^2 A_z}{\partial z \partial x} - \frac{\partial^2 A_x}{\partial z^2}; -\frac{\partial^2 A_y}{\partial x^2} + \frac{\partial^2 A_x}{\partial x \partial y} + \frac{\partial^2 A_z}{\partial z \partial y} - \frac{\partial^2 A_y}{\partial z^2}; -\frac{\partial^2 A_z}{\partial x^2} + \frac{\partial^2 A_x}{\partial x \partial z} - \frac{\partial^2 A_z}{\partial y^2} + \frac{\partial^2 A_y}{\partial y \partial z} \right) \end{aligned}$$

$$\begin{aligned} \text{grad div } \vec{A} &= \left(\frac{\partial}{\partial x} \left(\frac{\partial A_x}{\partial x} + \frac{\partial A_y}{\partial y} + \frac{\partial A_z}{\partial z} \right); \frac{\partial}{\partial y} \left(\frac{\partial A_x}{\partial x} + \frac{\partial A_y}{\partial y} + \frac{\partial A_z}{\partial z} \right); \frac{\partial}{\partial z} \left(\frac{\partial A_x}{\partial x} + \frac{\partial A_y}{\partial y} + \frac{\partial A_z}{\partial z} \right) \right) = \\ &= \left(\frac{\partial^2 A_x}{\partial x^2} + \frac{\partial^2 A_y}{\partial x \partial y} + \frac{\partial^2 A_z}{\partial x \partial z}; \frac{\partial^2 A_x}{\partial y \partial x} + \frac{\partial^2 A_y}{\partial y^2} + \frac{\partial^2 A_z}{\partial y \partial z}; \frac{\partial^2 A_x}{\partial z \partial x} + \frac{\partial^2 A_y}{\partial z \partial y} + \frac{\partial^2 A_z}{\partial z^2} \right) \end{aligned}$$

$$\nabla^2 \vec{A} = \left(\frac{\partial^2 A_x}{\partial x^2} + \frac{\partial^2 A_x}{\partial y^2} + \frac{\partial^2 A_x}{\partial z^2}; \frac{\partial^2 A_y}{\partial x^2} + \frac{\partial^2 A_y}{\partial y^2} + \frac{\partial^2 A_y}{\partial z^2}; \frac{\partial^2 A_z}{\partial x^2} + \frac{\partial^2 A_z}{\partial y^2} + \frac{\partial^2 A_z}{\partial z^2} \right)$$

$$\text{grad div } \vec{A} - \nabla^2 \vec{A} = \left(\frac{\partial^2 A_y}{\partial x \partial y} + \frac{\partial^2 A_z}{\partial x \partial z} - \frac{\partial^2 A_x}{\partial y^2} - \frac{\partial^2 A_x}{\partial z^2}; \frac{\partial^2 A_x}{\partial y \partial x} + \frac{\partial^2 A_z}{\partial y \partial z} - \frac{\partial^2 A_y}{\partial x^2} - \frac{\partial^2 A_y}{\partial z^2}; \frac{\partial^2 A_x}{\partial z \partial x} + \frac{\partial^2 A_y}{\partial z \partial y} - \frac{\partial^2 A_z}{\partial x^2} - \frac{\partial^2 A_z}{\partial y^2} \right)$$