$\vec{A}(x,y,z) = (M(x,y,z),\ N(x,y,z),\ P(x,y,z))$

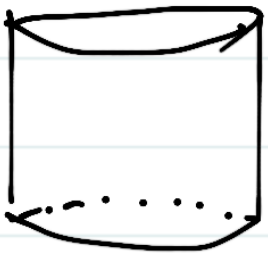
$$\text{rot}\,\vec{A} = \nabla \times \vec{A} = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ M & N & P \end{vmatrix}$$

$$= \begin{vmatrix} \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ N & P \end{vmatrix} i - \begin{vmatrix} \frac{\partial}{\partial x} & \frac{\partial}{\partial z} \\ M & P \end{vmatrix} j + \begin{vmatrix} \frac{\partial}{\partial x} & \frac{\partial}{\partial y} \\ M & N \end{vmatrix} k$$

$$= \left(\frac{\partial P}{\partial y} - \frac{\partial N}{\partial z}\right) i + \left(\frac{\partial M}{\partial z} - \frac{\partial P}{\partial x}\right) j + \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right) k$$

粘合

AC
BD ⇒



AD
CB ⇒ Möbius band

Klein Bottle: