Maxwell's Equations

(I) vector calculus

$$\vec{\nabla}\cdot\vec{E} = 4\pi\rho \quad \checkmark$$
$$\vec{\nabla}\cdot\vec{B} = 0 \quad \checkmark$$
$$\vec{\nabla}\times\vec{E} + \dot{\vec{B}} = \vec{0}$$
$$\vec{\nabla}\times\vec{B} - \dot{\vec{E}} = 4\pi\vec{J}$$

Ansatz: $\vec{B} = \vec{\nabla}\times\vec{A}$

$\vec{E} = -\vec{\nabla}\Phi - \dot{\vec{A}}$

(II) differential forms in $\mathbb{R}^3$

$$d{*}E = 4\pi * \rho \quad \checkmark$$
$$d{*}B = 0 \quad \checkmark$$
$$dE + *\dot{B} = 0$$
$$dB - *\dot{E} = 4\pi * J$$

Ansatz: $B = *dA$

$E = -d\Phi - \dot{A}$