Paper 53, Notes 8a.

## Magnetostatic Ampère Law

We have:

$$\underline{\nabla} \times \underline{B}^a + \underline{\omega}'^a{}_b \times \underline{B}^b = \mu_0 \underline{J}^{a\prime} \quad -(1)$$

where

$$\underline{B}^a = \underline{\nabla} \times \underline{A}^a - \underline{\omega}^a{}_b \times \underline{A}^b \quad -(2)$$

So:

$$\underline{\nabla} \times \left( \underline{\nabla} \times \underline{A}^a - \underline{\omega}^a{}_b \times \underline{A}^b \right) + \underline{\omega}'^a{}_b \times \left( \underline{\nabla} \times \underline{A}^a - \underline{\omega}^a{}_b \times \underline{A}^b \right) = \mu_0 \underline{J}^{a\prime} \quad -(3)$$

$$\underline{\nabla} \times \left( \underline{\nabla} \times \underline{A}^a \right) - \underline{\nabla} \times \left( \underline{\omega}^a{}_b \times \underline{A}^b \right) + \underline{\omega}'^a{}_b \times \left( \underline{\nabla} \times \underline{A}^a \right) - \underline{\omega}'^a{}_b \times \left( \underline{\omega}^b{}_c \times \underline{A}^c \right) = \mu_0 \underline{J}^{a\prime} \quad -(4)$$

$\Rightarrow$

$$\boxed{\nabla^2 \underline{A}^a - \underline{\nabla} \left( \underline{\nabla} \cdot \underline{A}^a \right) + \underline{\omega}'^a{}_b \times \left( \underline{\omega}^b{}_c \times \underline{A}^c \right) + \underline{\nabla} \times \left( \underline{\omega}^a{}_b \times \underline{A}^b \right) - \underline{\omega}'^a{}_b \times \left( \underline{\nabla} \times \underline{A}^a \right) = -\mu_0 \underline{J}^{a\prime}}$$

$$-(5)$$