Warm-Up for April 15th, 2022

Dr. Jordan Hanson - Whittier College Dept. of Physics and Astronomy

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1 Memory Bank

1. Magnetic boundary conditions:

$$B_{\perp}^{above} = B_{\perp}^{below} \tag{1}$$

$$B_{||}^{above} - B_{||}^{below} = \mu_0 K \tag{2}$$

$$\mathbf{B}_{above} - \mathbf{B}_{below} = \mu_0 \left(\mathbf{K} \times \hat{\mathbf{n}} \right) \tag{3}$$

$$\mathbf{A}_{above} = \mathbf{A}_{below} \tag{4}$$

$$\frac{\partial \mathbf{A}_{above}}{\partial n} - \frac{\partial \mathbf{A}_{below}}{\partial n} = -\mu_0 \mathbf{K} \tag{5}$$

$$\tag{6}$$

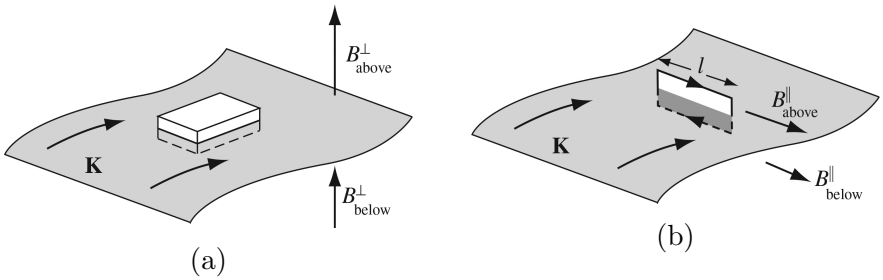

Figure 1: (a) Boundary conditions for **B**-fields, perpendicular to the surface. (b) Boundary conditions for **B**-fields, parallel to the surface.

2 Magnetic Boundary Conditions

1. Picture a long solenoid with current I and turns per unit length n. Derive the internal **B** and **A**-fields, and check each boundary condition above.