Electromagnetism Phys 3030
Assignment 1 (2005)

1. Properties of the Maxwell equations:
   a. Write down the Maxwell equations (in conventional 3D notation).
   b. Write down the Gauss, and Faraday’s laws in their integral form.
   c. Express the electric and Magnetic fields \( \mathbf{E}, \mathbf{B} \) in terms of the scalar and vector potentials \( V, \mathbf{A} \).
   d. Verify that the second pair of the Maxwell equations (the two equations, which do not incorporate the electric charge and the current) are automatically satisfied, when the fields are expressed via the potentials.

2. Applications:
   A square loop of wire (with side \( a \)) lies on the table, a distance \( s \) from a very long straight wire, which carries a current \( I \).

   Find the flux of \( \mathbf{B} \) through the loop.