

PHYS 102

Section 8 H. V. Demir
Spring 2008

Suggested Problems 8

1) Which of the following statements are **right** (a through e) and which ones are **wrong**? Which of the equations below (1 through 4) **are required to prove the rightness or the wrongness of the associated statement** (a through e)? **Why?**

ONE STATEMENT MAY OR MAY NOT REQUIRE MORE THAN ONE EQUATION FOR THE PROOF OF RIGHTNESS OR WRONGNESS.

STATEMENTS:

- a) Time-varying current flow through a resistive wire generates electric field around the wire.
- b) In a cylindrical capacitor that is being charged up, the electric field generated between the plates of the capacitor increases in time.
- c) A coil is placed inside a toroid. When a time-varying current is driven through the coil, the magnetic flux passing through the toroid can not be changed in time.
- d) The electric field is conservative in a static magnetic flux.
- e) An accelerating charge generates both magnetic field and electric field.

EQUATIONS:

$$1. \oint \vec{B} \cdot d\vec{s} = \mu_0 i_{enclosed} + \mu_0 \epsilon_0 \frac{d\phi_E}{dt}$$

$$2. \oint \vec{B} \cdot d\vec{A} = 0$$

$$3. \oint \vec{E} \cdot d\vec{s} = -\frac{d\phi_B}{dt}$$

$$4. \oint \vec{E} \cdot d\vec{A} = \frac{q_{enclosed}}{\epsilon_0}$$

RIGHT (R) or WRONG (W)? EQUATIONS REQUIRED FOR PROOF (1, 2, 3, or 4)?

e.g., Statement (x): W. 2, 3, 4. Because

Statement (a):

Statement (b):

Statement (c):

Statement (d):

Statement (e):

2) Calculate the mutual inductance between a very long straight wire and a conducting circular loop as shown in Fig. 1.

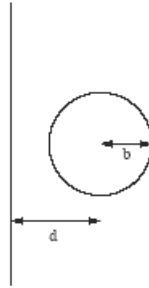


Figure 1. A very long straight wire and a conducting circular loop