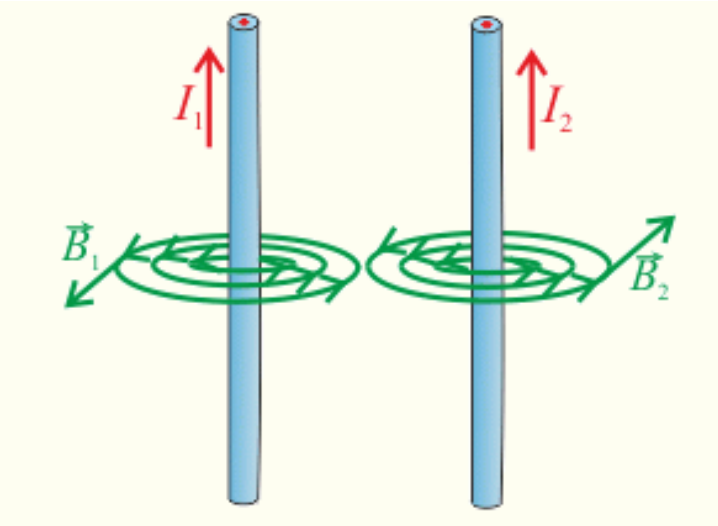
# Seminar 9: Lectures 17-18

**Print and answer all questions found below.**
**Please bring your completed worksheet to the Seminar Class.** [1]

## Question 1

Two straight parallel wires are separated by 6.0 cm. There is a 2.0 A current flowing in the first wire. If the magnetic field strength is found to be 0 T between the two wires at 2.2 cm from the first wire, what is the magnitude and direction of the current in the second wire?

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[1] It is assumed that you have access to the standard physical constants.

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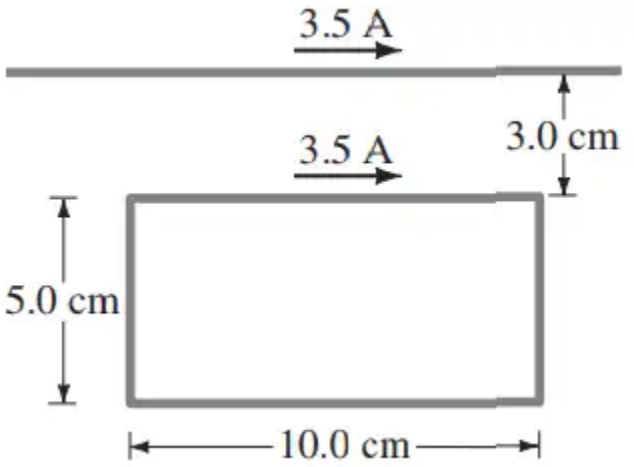
## Question 2

A rectangular loop of wire is placed next to a straight wire. There is a current of 3.5 A in both wires. Determine the magnitude and direction of the net force on the loop.



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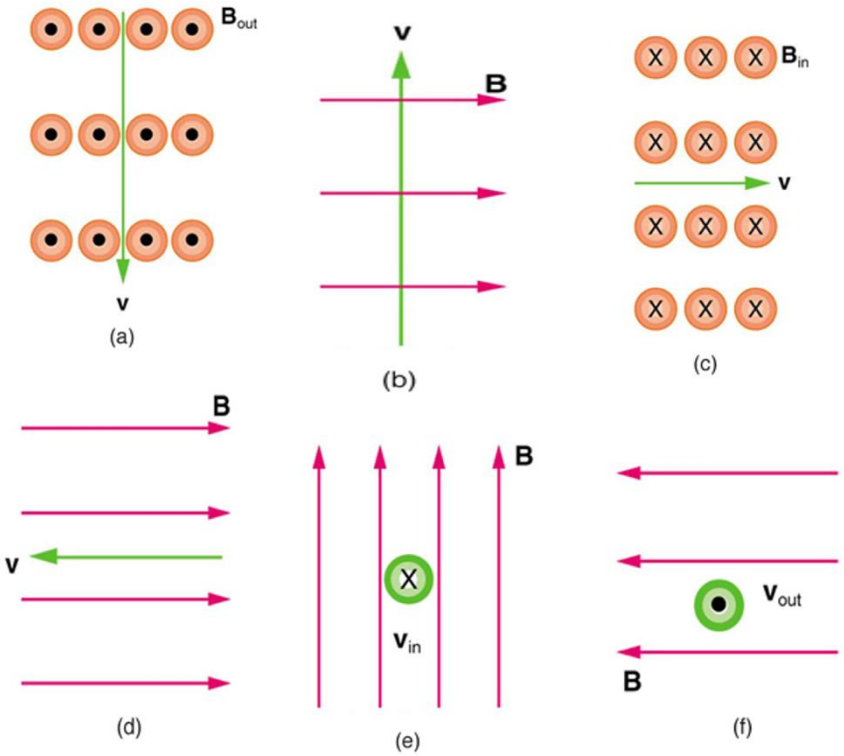
## Question 3

What is the direction of the magnetic force on a positive charge that moves as shown in each of the six cases shown below.



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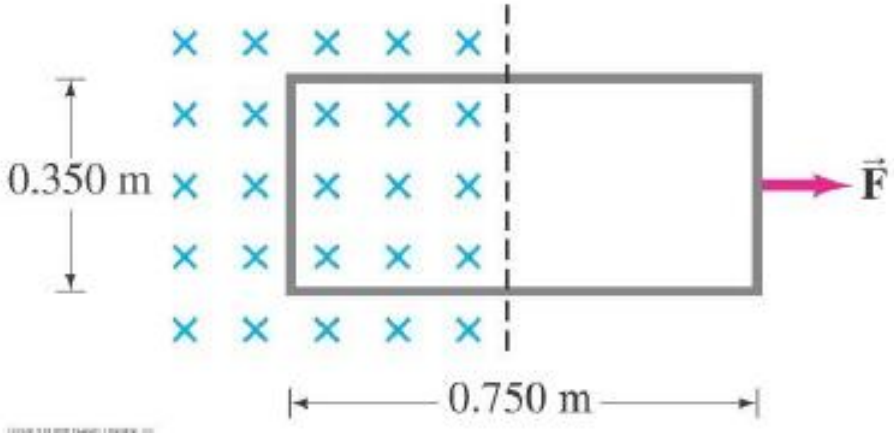
## Question 4

Part of a single rectangular loop of wire with dimensions shown in the figure below is situated inside a region of uniform magnetic field of 0.650 T. The total resistance of the loop is 0.280 Ω. Calculate the force required to pull the loop from the field (to the right) at a constant velocity of 3.40 m/s. Neglect gravity.



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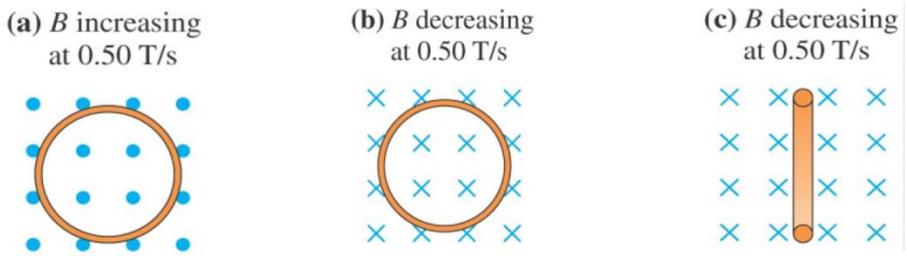
## Question 5

The figure below shows a 10-cm-diameter loop in three different magnetic fields. The loop's resistance is 0.20 Ω. For each, what are the size and direction of the induced current?



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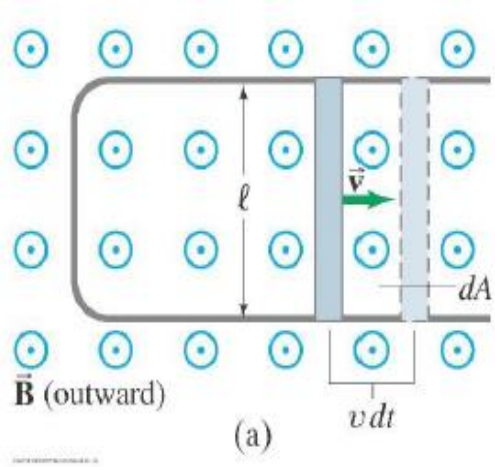
## Question 6

A rod moves to the right with a speed of 1.3 m. $s^{-1}$ and has a resistance of 2.5 Ω. The rail separation is $l$ = 25.0 cm. The magnetic field is 0.35 T, and the resistance of the U-shaped conductor is 25.0 Ω at a given instant. Calculate

(a) the induced emf,

(b) the current in the U-shaped conductor, and

(c) the external force needed to keep the rod's velocity constant at that instant.



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## Question 7

A 250-loop circular armature coil with a diameter of 10.0 cm rotates at $120\ rev/s$ in a uniform magnetic field of strength, 0.45 T.

(a) What is the $Vrms$ output of the generator?

(b) What would you do to the rotation frequency in order to double the $Vrms$ output?

## Question 8

A model-train transformer plugs into 120 V AC and draws 0.35 A while supplying 7.5 A to the train. Assume the transformer is ideal.

(a) What voltage is present across the tracks?

(b) Is the transformer step-up or step-down?