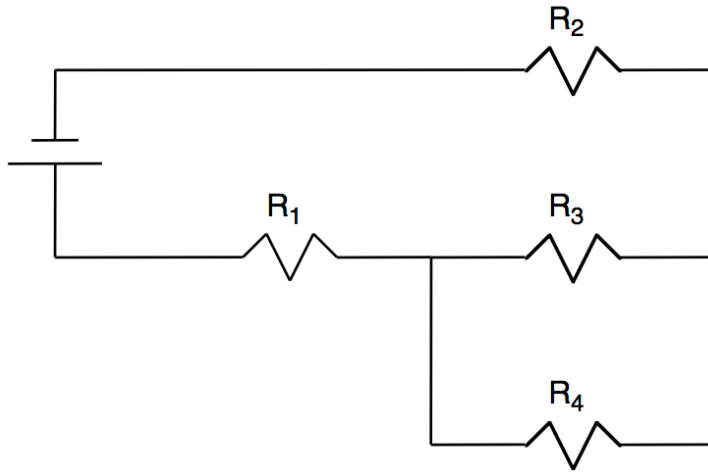# Physics 10164 – Spring 2020 Exam 2D

1. (30 pts) In the circuit below, the battery has an EMF of 18 Volts, and the resistors are R_1 = 1.0 Ohm, R_2 = 2.0 Ohm, R_3 = 3.0 Ohm, and R_4 = 4.0 Ohm.

Find the voltage drop across each of the four resistors.

2) (35 pts) Two straight wires are oriented perpendicular to the page as shown. Wire I_5 passes through the origin, and wire I_3 passes through the point x = 26 cm in the xy-plane (the plane of the page).

a) For what value of x (besides infinity) is the total magnetic field due to the two wires equal to zero?

b) An electron is moving toward the left side of the page through the point midway between the two wires. What is the magnitude and direction of the magnetic force on the electron if the velocity is 4.2 x 10^5 m/s?

$I_5 = 5.0$ A   26 cm $I_3 = 3.0$ A
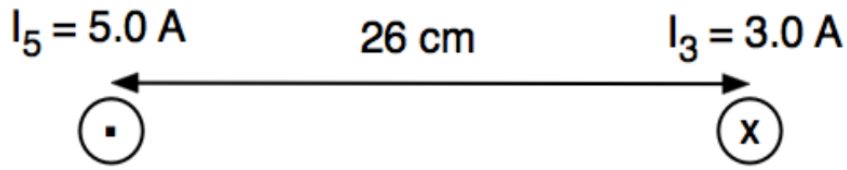
3) (35 pts) A 95-cm long, thin conducting rod is oriented East-West and is falling vertically downward with a speed of 37 m/s through a magnetic field with magnitude 45 μT pointing in a direction 28° vertically below due North.

a)   What is the magnitude of the induced EMF in the rod?
b)   Which end of the rod is positive, East or West?
c)   Assume 0.33 Amps of current flows through the rod in the same direction that positive charges are forced, what is the magnitude and direction of the magnetic force on the rod?