Book Problems:

Chapter 16: 27, 31, 43, 51, 69

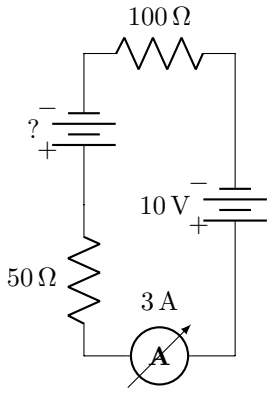
Chapter 17: 19, 25, 35, 41, 55

Chapter 18: 27, 29, 35, 41, 51

Chapter 19: 39, 45, 51, 65, 79

My Problems:

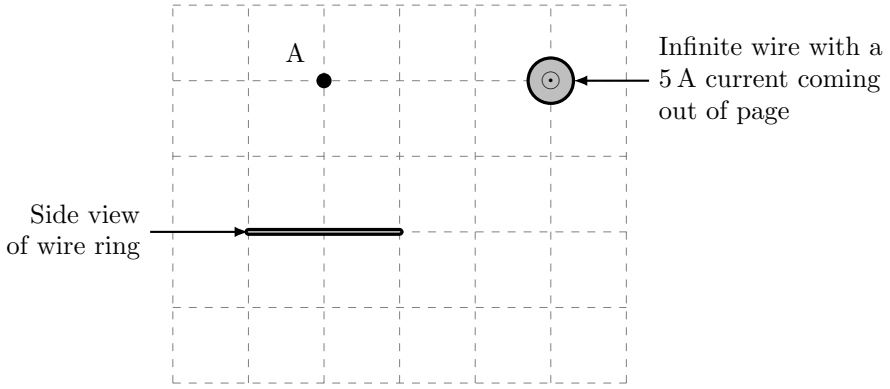
1. In the circuit below, your ammeter ($\textcircled{A}$) measures a current of 3 A. What is the working voltage of the unknown battery?



2. You are rummaging around in the Intro II lab (exciting! dangerous!) when you find some random insulating material. You pull out your (handy) parallel plate capacitor, hook it up to a 12 V battery, and after a short time measure (somehow) that the capacitor has 75 µC of charge stored on it.
   (a) What is the capacitance of your capacitor?
   (b) You then slide your mysterious insulating material between the plates of your capacitor, and measure the charge again. This time you measure a value of 0.278 mC. What is your mysterious material? The below table will be helpful.

Material	Dielectric Constant
Vacuum	1
Air	1.0006
Teflon	2.1
Polystyrene	2.6
Mylar	3.1
Paper	3.7
Pyrex glass	4.7
Pure Water	80
Titanium dioxide	110
Strontium titanate	300

3. Consider the situation below with an infinitely long wire carrying a current with is coming out of the page and a small wire ring seen edge-on. Each grid line is 1 cm.

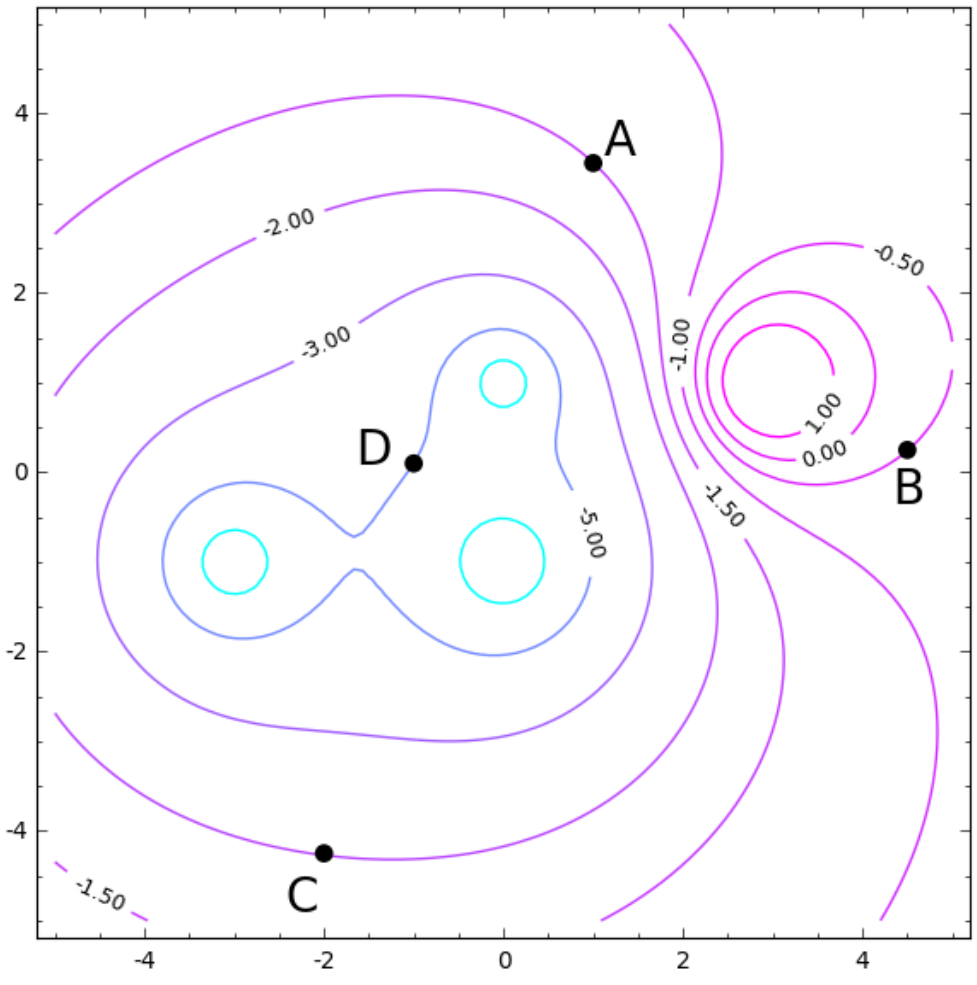


(a) At point A, what is the magnetic field due to the infinite wire? Express your answer in vector form.

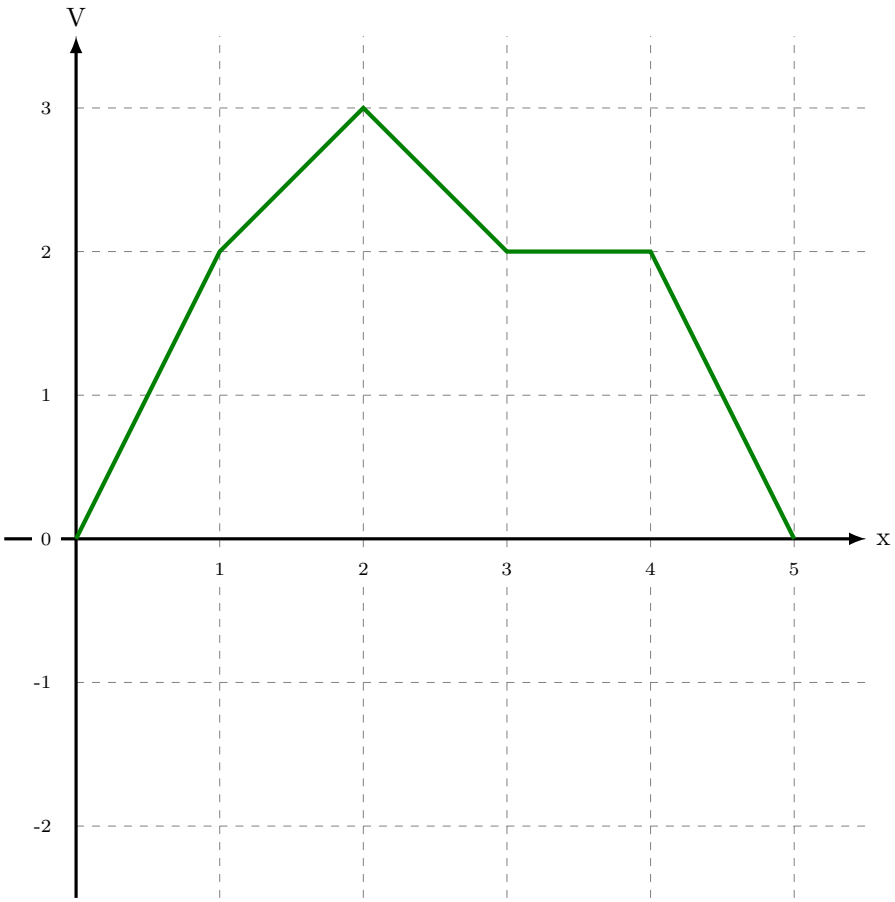
(b) What would be the needed magnetic dipole moment of the wire ring to ensure that the net magnetic field at point A was equal to 0?

(c) What is the current in the ring and in what direction is it moving (when viewed from above)?

4. We've talked previously about how we can visualize the electric potential as a sort of heightmap. This also means we can visualize it in 2D with contours, just like on a topological map. The equipotential plot below does this by sketching lines of constant electric potential. And values are given in volts. Use the plot to answer the following questions:
   (a) What is the electric potential of a 100 µC charged hamster located at point A?
   (b) What is the potential energy of the same hamster located at point B?
   (c) Our charged hamster starts from rest at point C and is traveling at 15 cm/s at point D. What is the mass of our hamster?



5. Given the plot below, plot the following over the same distance interval. You can assume that the particle has a charge of 0.5 C and that its mass is 2 kg.
   (a) The potential energy
   (b) The electric field strength
   (c) The electric force strength
   (d) The particle's acceleration



Solutions:

1. 460 V
2. 6.25 µF, $\kappa = 3.696 \Rightarrow$ paper
3. Parts:
   (a) 33.3 µT $\langle 0, -1, 0 \rangle$
   (b) 1.33 A m^2
   (c) 4.24 A
4. Parts:
   (a) -1.50 V
   (b) -50 µJ
   (c) 26 g
5. Plotted all at once, so y-axis relevant units for each.