Review for MT2

Lecture 16

Announcements

- Midterm 2 tomorrow night.
- New seating chart posted.
- Note that we are in two rooms.
 - My fault.
 - Check which room you are in!
 - Only four students.

Topics covered

- E potential energy
- E potential
- Relation between: Charge distributions, E & V
- Equipotentials
- Capacitance

- Dielectrics
- Current & Ohm Law
- Resistance
- Kirchhoff/Multiloop

"Review": Variable Resistors

 $R_1 a$

• What is the relation between *R*₁, *R*₂ and *a*?

$$R = \frac{L}{A}\rho$$



 R_2

Review of an old checkpoint



• How do we efficiently approach this problem?

Electric Potential/Potential energy and Work/E field

• Torture by minus sign!

$$\vec{E} = -\vec{\nabla}V \qquad dW = -dU \qquad U = qV$$

Examples



Examples

4. (3 pts.) The vector that best represents the direction of the electric field at point \mathbf{x} on the 200 V equipotential line is

- A) 1
- B) 2
- C) 3
- D) 4
- E) None of these is correct.



Charge configuration/ Potential Energy/Work

5. (3 pts.) Three charges are brought from infinity and placed at the corners of an equilateral triangle. Which of the following statements is <u>true</u>?

- A. The work required to assemble the charges is always positive.
- B. The electrostatic potential energy of the system is always positive.
- C. The electrostatic potential energy does not depend on the order the charges are placed at the corners.
- D. The work required to assemble the charges depends on which charge is placed at which corner.
- E. The electrostatic potential energy depends on which charge is placed at which corner.

- Cylindrical conductor length L charge +Q. Find potential difference from the center as a function of r.
- Cylindrical insulator (uniform c.d.) length L charge +Q. Find potential difference from the center as a function of r.

Please **practice** loop problems

Loop law example

7. (4 pts.) With the switch open as shown, what is the current I_1 ?

(A) $I_1 = -7/2 A$ (B) $I_1 = -1/2 A$ (C) $I_1 = 1/2 A$ (D) $I_1 = 3/2 A$ (E) $I_1 = 7/2 A$

8. (4 pts.) What is the voltage across the 4 ohm resistor?

- (A) 2 V
- (B) 6 V
- (C) 7 V
- (D) 8 V
- (E) 14 V

More examples

9. (3 pts.) Which of the currents have changed in magnitude after the switch is closed?

- (A) Only I₃ has changed in magnitude.
- (B) Only I₂ and I₃ have changed in magnitude.
- (C) I_1 , I_2 , and I_3 have all changed in magnitude.
- (D) No currents have changed in magnitude.

Resistors \sim \sim \sim \sim \sim

