Lecture 3

Electric Field – Chapter 23

Examples from Chapter 22

Exam Date Change

- The last mid-term exam has been moved from Wednesday Dec. 4th to Tuesday Dec. 3rd

- Have 2 days of review Dec. 4th and 6th for the final exam

- All mid-term exams will be in N130 BCC (the business college)

Helproom Hours

- **Room 1248** (Strosacker Center)
  - Mon. 1-3 pm and 6-8 pm
  - Tues. 11 am-3 pm and 5-9 pm
  - Thurs. 3-5 pm
- **Room 1240** (around corner from 1248)
  - Fri. 3-4 pm
- **On-line CAPA discussion**
  - Every night but Wed. & Sat. from 8-9pm

Helproom Policies

- Helproom is for collaborative learning
- TAs will sit in front of room at tables
- Computers are for entering answers
  - Not for reading email or browsing the web
  - Will be logged out automatically after 15 min
  - Computer use may be monitored
- No food or drink is allowed in helproom!

Electric Field (1)

- How does a charge, q_1, exert a force on another charge, q_2, when the charges don't touch?

- The charge, q_1, sets up an electric field in its surrounding space

- This electric field has both magnitude and direction which determine the magnitude and direction of the force acting on q_2

Electric Field (2)

- What happens to the field if q_1 moves?

- Force acting on q_2 does NOT change immediately

- Info about q_1 travels outward from it as an electromagnetic wave at speed of light, c

Electric Field (3)

- Electric field is a vector field
  - Consists of a distribution of vectors

- Define electric field at a point near the charged object by using a positive test charge, q_0

Electric Field (4)

- Test charge - charge which feels forces of other charges but exerts no force on them
  - Mathematical construct

- Electric field exists independently of the test charge

Electric Field (5)

- Electric field, *E*, is the force per unit test charge

$$\vec{E} = \frac{\vec{F}}{q_0}$$

- SI unit for *E* field is *N/C*

- Direction of *E* is the direction of *F*

Electric Field (6)

- Use electric field lines to visualize E field

- Field lines point away from positive charges and towards negative charges

- At any point, the tangent to the field line is the direction of the E field at that point

- Density of field lines is proportional to the magnitude of the E field

Electric Field (7)

- Electric field lines:

  - Close to a point charge are radial in direction

  - Do not intersect in a charge-free region

  - Do not begin or end in a charge-free region

Chapter 22 – Question #1

- Does Coulomb's law hold for all charged objects?

<p align="center">NO</p>

- Only for charged particles, charged particle-like objects and spherical shells (including solid spheres) of uniform charge