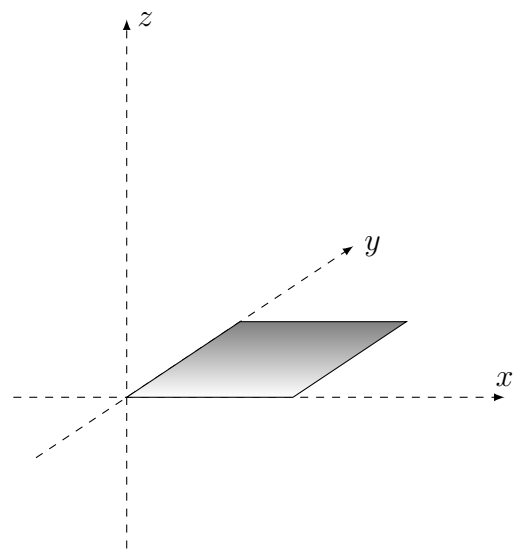
Interactive Problem Set 6, SP212 Spring 2013

Topic: 23.1 - 23.4 Flux and Gauss' Law

IPS 6.1 (in-class) A square of edge length 6.00 cm lies in xy plane with a corner on the origin. A uniform electric field $\vec{E} = (3.00\hat{i} + 4.00\hat{j} + 5.00\hat{k})$ N/C fills all of space in the vicinity.

- Express the area of this square as a vector in "hat" notation and sketch this vector into the diagram. *There are two valid choices!*
- What is of the electric flux through the square?*

* *Because there are two valid choices for the area vector, depending on your choice you will get either a + or a − answer.* ***For closed surfaces we always choose outward pointing area vectors.***



IPS 6.2 (in-class)

- Imagine a virtual cube immersed in a uniform electric field.
- How do can we visualize a uniform field in our minds?
- In your visualization, find an electric field line that punches into your virtual cube, can you see that if you follow it, it eventually *must* also punch out of your virtual cube?
- What can we conclude about the net flux through the cube?
- What can we conclude about the charge inside the cube?
- In your mind, now replace the cube with the surface of a 3D blob with lots of bends and curves. Follow one of your field lines, can you see that each time in punches in, it punches out? What can we conclude?

IPS 6.3 (in-class)

- Imagine all that is around is a single positive charge $+Q$ sitting on the origin and the electric field that it produces.
- Imagine a virtual cube centered on the origin (the positive charge is at the center of the cube).
- What is different about the electric field lines from the positive charge in this case compared to above?
- What would change in our visualization if the $+Q$ were replaced with a $-Q$?

NO NEW HOMEWORK PROBLEMS! Use the time between now and the next class to close ANY gaps in any of the work we've done so far.

Reading for next class: Read again WPC Ch23. In the text, carefully read section 23.5 on page 612 along with a careful study of figure 23-8.