Phys 222 SI Session #7

**Topics:** Gauss’s Law

Intro discussion Part 1: Netflix, Hulu, or Amazon streaming?
Intro discussion Part 2: What is the best show to binge watch?

1. Consider a spherical Gaussian surface of radius $R$ centered at the origin. A charge $Q$ is placed inside the sphere. To maximize the magnitude of the flux of the electric field through the Gaussian surface, where should the charge be located?

2. A point charge $+Q$ is placed at the center of a hollow metal sphere with outer radius 3.0 m and inner radius 1.5 m. Once the system is in equilibrium, there is a charge $-2Q$ distributed evenly over its outer surface (i.e., at $r = 3.0$ m). What is the net charge on the sphere?

3. A cube 4.0 m on a side has one corner at the origin, and the faces are aligned with the coordinate axes as shown. There is a non-uniform electric field described by $E = (20 \, m - z) \hat{k} \frac{N}{m^2}$. What is the net charge inside the cube, in nC?

4. An infinitely long solid cylinder of radius 40 cm is made of an insulating material and has a uniform charge density of 6.0 nC/m$^3$. What is the magnitude of the electric field at a distance of 20 cm from the axis of the cylinder, in N/C?

5. A non-conducting sphere of radius $R = 7.0$ cm carries a charge $Q = 4.0$ mC distributed uniformly throughout its volume. At what distance(s), measured from the center of the sphere, does the electric field reach a value equal to half its maximum value?

6. A solid sphere of radius $R$ carries a charge $Q$ distributed uniformly throughout its volume. At a certain distance $r_1$ ($r_1 < R$) from the center of the sphere, the electric field has magnitude $E$. If the same charge $Q$ were distributed uniformly throughout a sphere of radius $2R$, the magnitude of the electric field at the same distance $r_1$ from the center would be equal to what factor of $E$?