**Problem Set 11 Gauss’s Law (Due 05/27/2025 before class)**

**Late homework will NOT be accepted, unless you have notified the course instructor 3 days BEFORE deadline.**

**Part I (60%)**

**文本, 信件

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一些文字和图片的手机截图

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A text and a diagram

Description automatically generated with medium confidence

**Part II (40%)**

1. Determine the electric flux for a Gaussian surface that contains 100 million electrons.
2. A uniformly charged solid spherical insulator has a radius of 0.23 m. The total charge in the volume is 3.2 pC. Find the E-field at a position of 0.14 m from the center of the sphere.
3. Two extremely large insulating planes each hold 1.8 C of excess charge. One plane is charged negatively and the other is charged positively. The planes are separated by a very small distance so that a uniform E-field is set up between them. Each plane is 1000 m wide and 1000 m long. Determine the magnitude of the E-field in between the planes and outside the planes.
4. An infinitely long line of charge carries 0.4 C along each meter of length. Find the E-field 0.3 m from the line of charge.
5. Two very long lines of charge are parallel to each other, separated by a distance x. They each have the same linear charge density λ. One is positive and the other is negative. (a) What is the magnitude of the E-field at a point half-way between the lines of charge? (b) How does the E-field at a point x/3 from the the the positive charge line (and 2x/3 from the negative charge line) compare to the E-field x/3 from the negative charge line (and 2x/3 from the positive charge line). Express in terms of εo,λ and x
6. A soccer goal, found is a city park, is made of tubing that supports an odd-shaped hanging net behind the goal, but has a rectangular opening in front. The height of the opening is 2.5 m and the width is 3.2 m. If a uniform E-field, with a mangnitude of 0.1 N/C, passes through the goal from the front to the back, entering at 90º to the plane of the goal opening, what is the flux through the net? Also, find the flux through the net if the E-field enters the goal at a 60° angle to the plane of the front of the goal. In both cases, assume that there is no charge found inside the goal itself.
7. A cubic space (1.5 m on each side) contains positively charged particles. Imagine that the space is surrounded by a Gaussian surface of the exact same dimension as the cube and that the E-Field caused by the charges is normal to the faces of the Gaussian cube. If the E-field at each surface has a magnitude of 760 N/C, determine the number of charges per unit volume in the space described (ie., find the charge density, ρ).
8. A sphere with a uniform volume charge distribution pv = 3 C/m3 has a radius of 3 m. What is the electric field at point C?

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1. A sphere of radius 5 cm contains a charge of 66 nC, calculate the electric flux.
2. Which A long line carrying a uniform linear charge density +50 μC/m runs parallel to and 10.0 cm from the surface of a large, flat plastic sheet that has a uniform surface charge density of -100 μC/m2 on one side. Find the location of all points where an α particle would feel no force due to this arrangement of charged objects