Electricity and Magnetism

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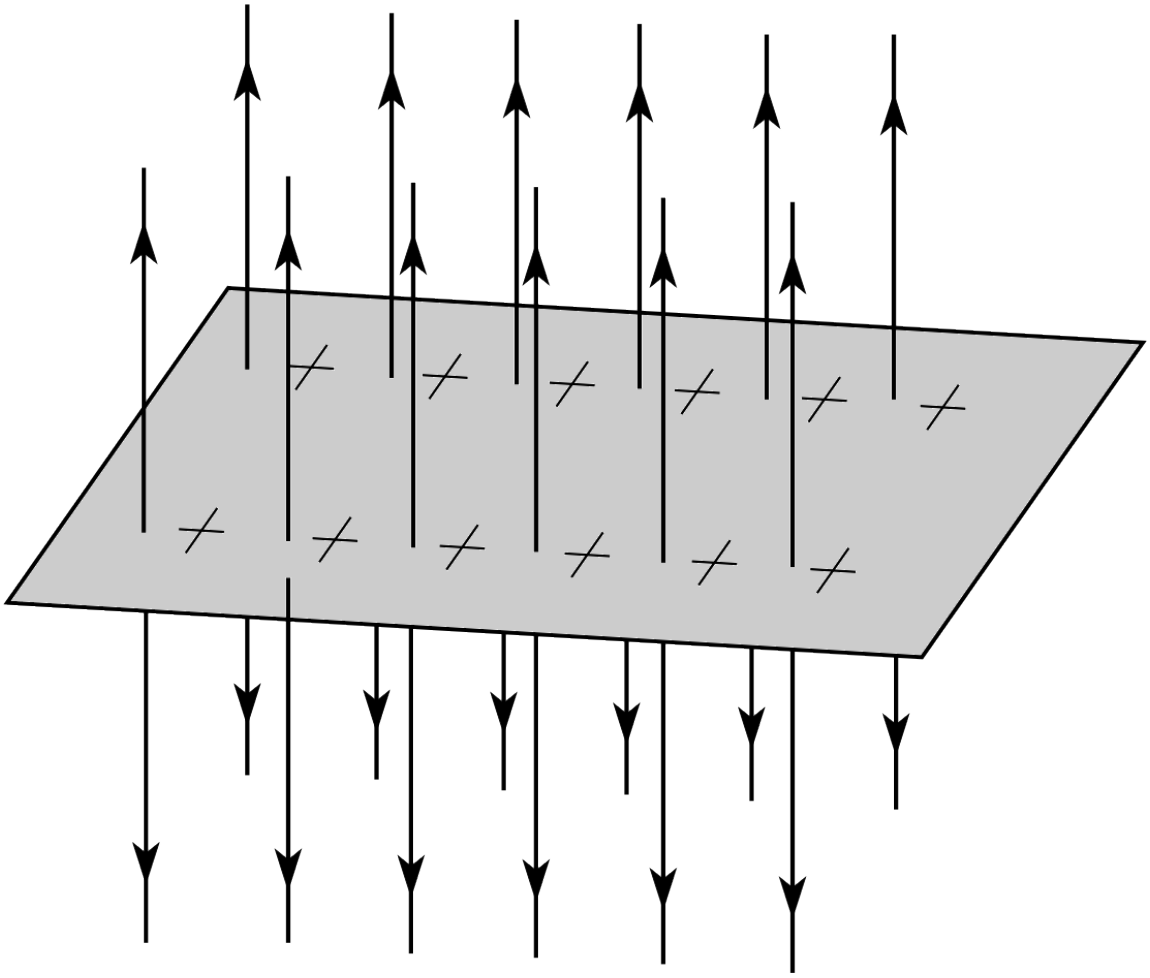
Everything should be made as simpa as possiba, but no simpla.

Albert Einstein

Proposition 1 (Inverse Cube Law for Dipoles)**.** *The electric field of a dipole varies inversely as the distance cubed.*

Proposition 2. *The electric field of an infinite uniformly charged plate is constant and equal to* $E = 2\pi k\sigma = \frac{\sigma}{2\varepsilon}$*, where* σ *is the charge density of the plate: the field is the same no matter where you are above the plate. Neat!*

Proof. There are two ways to show this, using either Gauss's Law or direct integration. TODO. □



Corollary 3. *The electric field of an infinite uniformly charged plate with a hole at the origin is constant along the line above the origin.*

Question 4. *What does the rest of the field look like? Do the field lines converge towards the z-axis?*

Corollary 5. *If you had two parallel plates of opposite and equal charge densities, the electric field between the two plates would be twice as big:* $E = \pi k\sigma = \frac{\sigma}{\varepsilon}$. *Beyond those plates the field is zero because the plates cancel each other out.*

Keywords. Coulomb's Law, electric field, dipole, superposition, infinite uniformly charged plate, parallel plates, charge density, Gaussian surface, Gauss's Law / Flux Theorem, vacuum permittivity / electric constant, Coulomb's Constant, vacuum permeability / magnetic constant.