Worksheet 1

1. Line of charge
   Use Gauss' law to find the electric field a distance r from an infinite line of charge.
   (a) First use the symmetry of the object under consideration to choose a Gaussian surface.
   (b) Write the charge enclosed by this surface in terms of a constant *line* charge density λ .
   (c) Construct the surface normal unit vectors for each *face* of the Gaussian surface (if you choose your Gaussian surface properly some fluxes will be zero).
   (d) Write $\vec{E}.\hat{n}$ in terms of the magnitude E ($E=|\vec{E}|$)
   (e) Calculate the electric flux $(\vec{E}.\hat{n})A$ for each face. Use Gauss' law to find the electric field at all distances from the line.

2. Infinite sheet of charge
   (a) First use the symmetry of the object under consideration to choose a Gaussian surface.
   (b) Write the charge enclosed by this surface in terms of a constant *surface* charge density σ .
   (c) Construct the surface normal unit vectors for each *face* of the Gaussian surface.
   (d) Write $\vec{E}.\hat{n}$ in terms of the magnitude E ($E=|\vec{E}|$)
   (e) Calculate the electric flux $(\vec{E}.\hat{n})A$ for each face (if you choose your Gaussian surface properly some fluxes will be zero).
   (f) Calculate the total electric flux. Use Gauss' law to find the electric field at all distances from the sheet.