GAUSS THEOREM MEMO

- Identify the coordinate system
  ex: spherical distribution
  ↳ spherical coordinate system
  cylindrical distribution of charge
  ↳ cylindrical coordinate system
- Determine the invariance of the electric field
  → perform the study of the symmetry created by the charge on different receiver points in the space
  → identify $\vec{E}$ direction and orientat° → identify the unit vector related in the basis of coordinate
- Choose the Gauss surface (S)
  → Choose the appropriate shape with the electric field symmetries
  → Σg closed
  → $M \in \Sigma g$, M being a receiver point. It can have ≠ possible locati
  → $Q_{int} \in \Sigma g$

  → Several Σg can be chosen if we want to determine $\vec{E}$ everywhere in the space (inside and outside the shape)
- Identify the $\vec{dS_g}$:
  > unity vector that is carrying $\vec{dS}$ (or the projection)
  > $\|\vec{dS_g}\| = dS$ expression (if it is needed)
- Calculate the charge $\in \Sigma g$: Q_{int}
  λ if 1D
  σ if 2D
  ρ if 3D
  ⚠ choose the good R to consider
- Calculate $\oiint \vec{E}.\vec{dS}$ expression, using if needed the ≠ parts of Σg

  ⚠ Don't forget the scalar product of the unit vectors of $\vec{dS}$ and $\vec{E}$
- $\oiint \vec{E}.\vec{dS} = \frac{Q_{int}}{\varepsilon_0}$
  → extract the expression of E from the equation
- $\vec{E} = E \cdot$ unit vector
  V from $\vec{E} = -\vec{grad}(V)$
- Potential computation → take into account the boundaries conditions
  → α, β ...