TFE4120 - Exercise Session 1

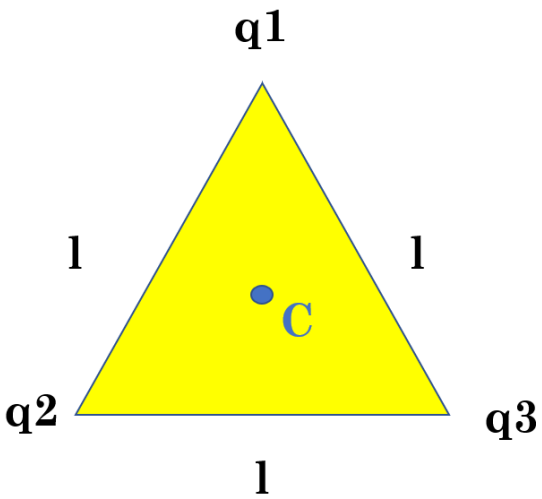
January 11, 2021

Exercise 1

In order to organize the exercise tutorials in a efficient way, it is nicer that not everybody starts in the same point. Please try to start at the exercise corresponding to the first letter of your last name and work your way around. E.g., if my last name is Granerud, I will start with Exercise 2, then 3, 4, 5, 1. Of course if you feel like an exercise is really too difficult to start with you may skip.

Please start here with last name starting with A-F.

Calculate the electrostatic potential in C.



Exercise 2

Please start here with last name starting with G-L.

Calculate the electrostatic field $\vec{E}$ and potential V at an arbitrary point P along the x-axis. The thin ring has radius R and a total charge q.

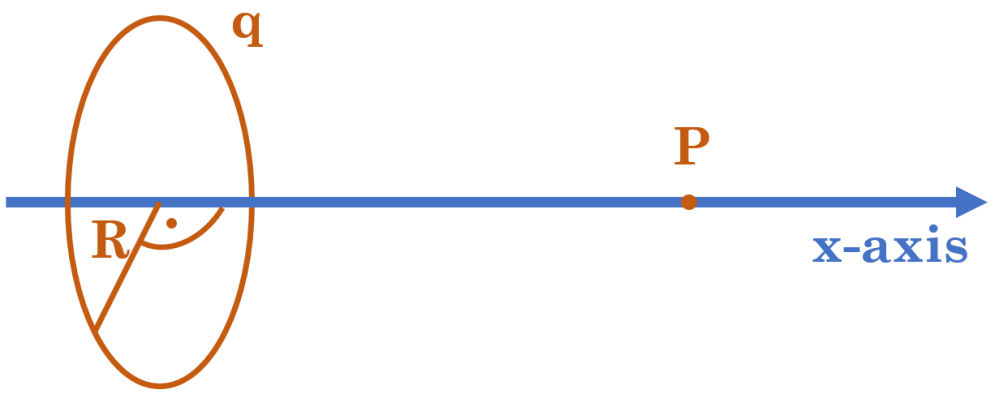


Figure 1: Thin ring with total charge q and radius R centered around the x-axis.

Exercise 3

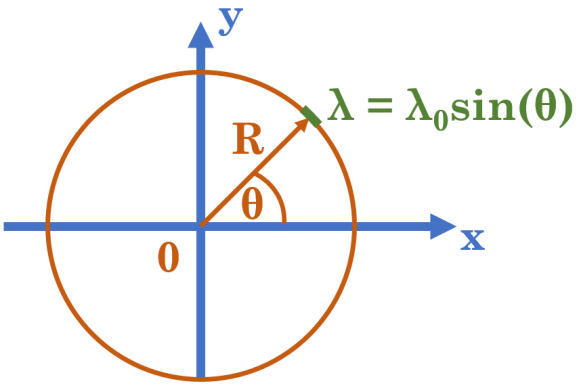
Please start here with last name starting with M-R.

Express the equation of motion for a particle with electric charge q and mass m, such that $\frac{q}{m} = 5{\cdot}10^6 \frac{\mathtt{C}}{\mathtt{kg}}$, within an electrostatic potential defined over the xy-plane as $V(x,y) = V_0(x^2{+}y^2)$, where $V_0 = 10^7 \frac{\mathtt{V}}{\mathtt{m}^2}$. At time $t = 0$, the particle is in point $P(x_0, 0)$ and has a velocity $\vec{v} = v_0\vec{u_y}$, where $x_0 = 1\text{cm}$ and $v_0 = 10^5 \frac{\mathtt{m}}{\mathtt{s}}$.

Exercise 4

Please start here with last name starting with S-Z.

Calculate the expression of the electrostatic field in the center O of an annular distribution of electric charge, having linear density $\lambda = \lambda_0 \sin\Theta$, as depicted in the figure.



Exercise 5

Express the electrostatic field produced by a disk-shaped planar distribution of electric charge with constant density $\sigma \left[\frac{\mathrm{C}}{\mathrm{m}^2}\right]$ at an arbitrary distance x along the axis.

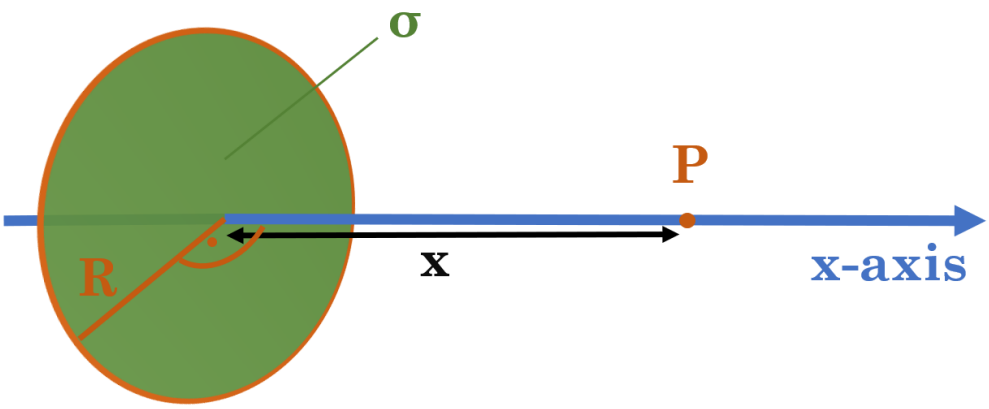


Figure 2: Disk lying in the yz-plane, with planar distribution of electrical charge σ.