Electrostatic Potential

- Reminder: **Electric Field** = electric force acting on a probe charge q, divided by q:

$$\vec{E} = \frac{\vec{F}_{elect}}{q}$$

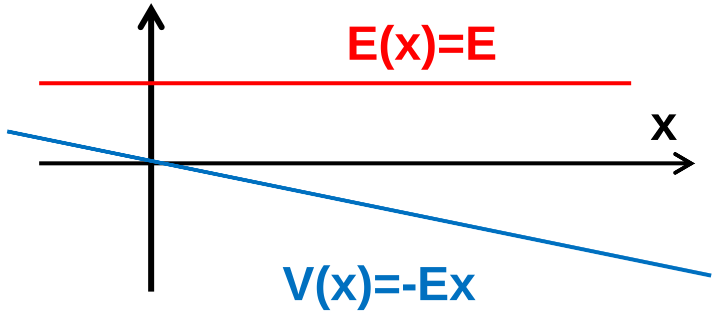
- Similarly, **Electrostatic Potential** = electrostatic potential energy divided by charge. It is also known as Voltage, since SI unit of potential is Volt (V):

$$V = \frac{U_{elect}}{q}$$

- **Example.** Consider constant electric field E(x)=E,(as inside a capacitor). Potential energy change = - Work:

$$\Delta U_{elect} = -F_{elect}\Delta x = -Eq\Delta x$$

$$V(x) = \frac{U_{elect}}{q} = -Ex$$



Homework

Problem 1. The figure shows an outline of the famous oil drop experiment by Millikan and Fletcher that was done at the University of Chicago in 1909-1913. The goal was to find the magnitude of electron's electric charge. In the experiment, tiny oil droplets were trapped between two electrodes. The masses of the droplets were measured by observing their motion under gravity, in the presence of air. After that, the electric field was switch on and tuned to the value at which it balances the gravity. Due to the X-rays, the charge on the oil was occasionally changing, so the field had to be changed too, to preserve the balance.
Let's say, you observe an oil droplet of mass $m=10^{-14}$ kg. Find the charge of an "electron", if the droplet could be balanced at the following values of the voltage between the two plates: 1020 V , 1225 V , 1360 V ,1530 V , 1750 V. Separation between plates is 10cm.
(Your answer will be different from the known electron charge. So was Millikan's)