

Charge is conserved. As far as we can tell, the total amount of electric charge in the Universe (positive + negative charges) is exactly zero, and it must stay that way.

Opposite charges attract. Like charges repel. The way in which two point charges attract (or repel) is given by Coulomb's Law.

$$\vec{F} = k \frac{q_1 q_2}{r^2} \hat{r} \quad (\text{Coulomb's law})$$

$$\vec{F} = G \frac{m_1 m_2}{r^2} \hat{r} \quad (\text{Newton's law})$$

$$k = \frac{1}{4\pi\epsilon_0} = 8.99 \times 10^9 \text{ N} \cdot \text{m}^2/\text{C}^2$$

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^2$$

$$e = 1.602 \times 10^{-19} \text{ C}$$

one amp = one coulomb of charge per second

$$= 1 \text{ C} / (1.602 \times 10^{-19} \text{ C/electron}) \text{ per second}$$

$$= 6.24 \times 10^{18} \text{ electrons per second}$$

(electric current)

$$i = \frac{dq}{dt} = \rho(x)v(x)$$



