Newtons Law of Cooling

When the hot body is exposed to the surrounding it continously loss the heat to the surrounding. Then Newtons law of cooling states that "The rate of heat lost by hot body is directly proportional to the tempr difference between hot body & surrounding."

Let θ & θ_0 be the tempr of hot body & surrounding, $\frac{dQ}{dt}$ be the rate of heat loss.

Then from above statement,

$$-\frac{dQ}{dt} \propto (\theta - \theta_0)$$

$$\frac{dQ}{dt} = -k(\theta - \theta_0) \quad \text{---(i)}$$

where k is the proportionality constant whose value depends upon the nature of substance & surface area exposed to the surrounding & -ve sign shows that amount of heat decreases with increase in ~~tempr~~ time.

Let m & s be the mass of specific heat capacity of hot body. $d\theta$ be the small fall in tempr in small time dt.

so, $dQ = ms\,d\theta$ ——— (ii)

dividing eqn (ii) on both side by dt

$$\frac{dQ}{dt} = \frac{ms\,d\theta}{dt} \quad \text{———(iii)}$$

Then from eqn (i) & (ii) we get

$$\frac{ms\,d\theta}{dt} = -k(\theta - \theta_0)$$