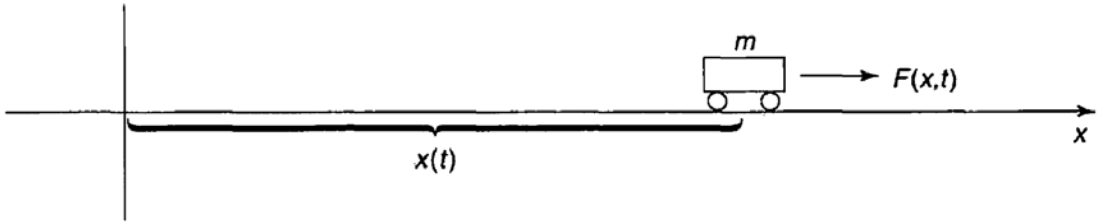
Introduction

In non-relativistic classical mechanics, Newton's law says

$$ma = F$$



It is a second order differential equation. Assuming the force is conservative (arises from a potential energy function *V(x)*, unlike friction) in 1D (for simplicity) it becomes:

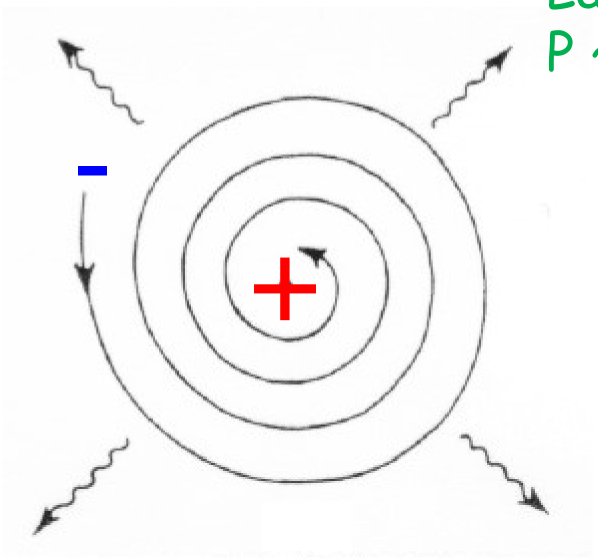
$$m\, d^2x/dt^2 = -\partial V/\partial x$$

Then, typically we solve this 2nd order differential eq. with some initial conditions at $t=0$, such as $x(0)$ and $dx/dt\ (t=0)$, and find $x(t)$.

From $x(t)$ we get position, velocity, acceleration, kinetic energy, etc.

In addition, we have Maxwell's equations for electrodynamics.
All seems very nice and clear, right?

<u>However, at the atomic level classical physics does not work</u>



Larmor radiation
$P \sim a^2$

The classical view of an atom as a miniature "solar system" does not work because electron and proton are charged, unlike planets around the Sun.

Within classical electromagnetism (Maxwell eqs) charged particles in a circular orbit loose energy because they emit Larmor radiation. Lifetime estimated to be 10^{-10} seconds.