Formulas

magnetic flux density / magnetic field strength

$$\phi = B A \sin\theta$$

magnetic flux — angle b/w Area and M field lines.

$$\Phi = N B A \sin\theta$$

magnetic flux linkage.

$$\text{Emf} = \frac{d\Phi}{dt}$$

$$V_H = \frac{BI}{net}$$

- Magnetic flux is the product of the magnetic flux density and the area normal to the lines of flux

Area magnetic field

$$\text{magnetic flux } (\Phi) = B\ A \sin\theta$$

Angle between B and A

Magnetic field strength/ Magnetic flux density

- Magnetic flux linkage is the product of magnetic flux linkage and the number of turns in the coil.

$$\text{Magnetic flux linkage } (\Phi) = N B A \sin\theta$$

- E.m.f can be induced by a magnetic field, this is called electromagnetic induction (E.M.I)

The galvanometer detects very small currents but it is important to realise that what is being detected are small electromotive forces (e.m.f.s). The current arises because there is a complete circuit incorporating an e.m.f. The following observations can be made.

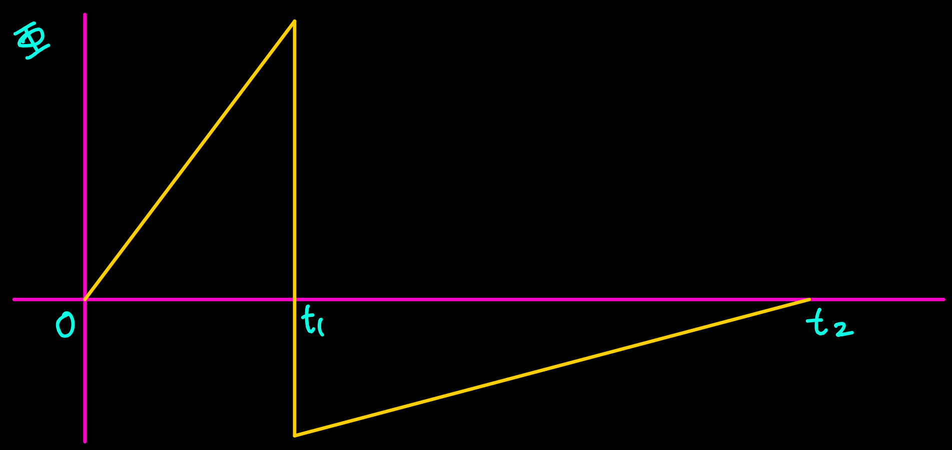
- An e.m.f. is induced when
  - the wire is moved through the magnetic field, across the face of the pole-pieces
  - the magnet is moved so that the wire passes across the face of the pole-pieces.
- An e.m.f. is *not* induced when
  - the wire is held stationary between the pole-pieces
  - the magnet is moved so that the pole-pieces move along the length of the wire
  - the wire moves lengthways so that it does not change its position between the poles of the magnet.
- The magnitude of the e.m.f.
  - increases as the speed at which the wire is moved increases
  - increases as the speed at which the magnet is moved increases
  - increases if the wire is made into a loop with several turns (see Figure 23.3)
  - increases as the number of turns on the loop increases.

Faradays law

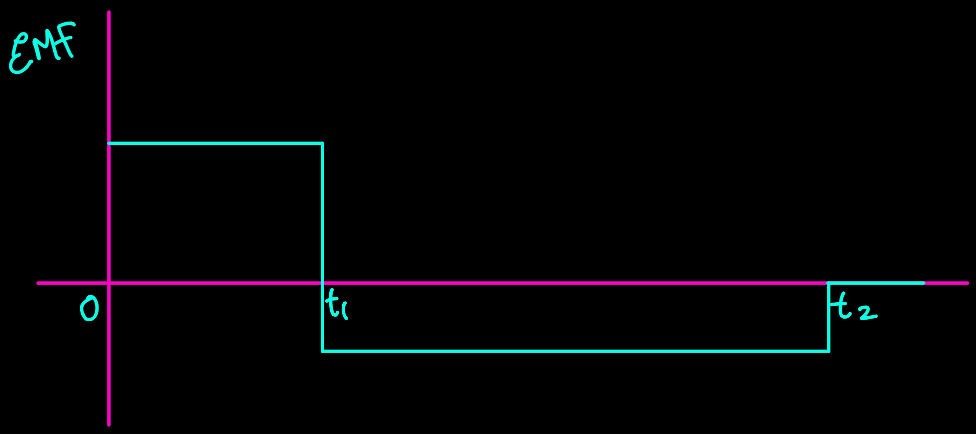
- The induced EMF is Proportional to the rate of change of Magnetic flux linkage (Φ).

$$\text{EMF}_{\text{induced}} \propto \frac{d\Phi}{dt}$$

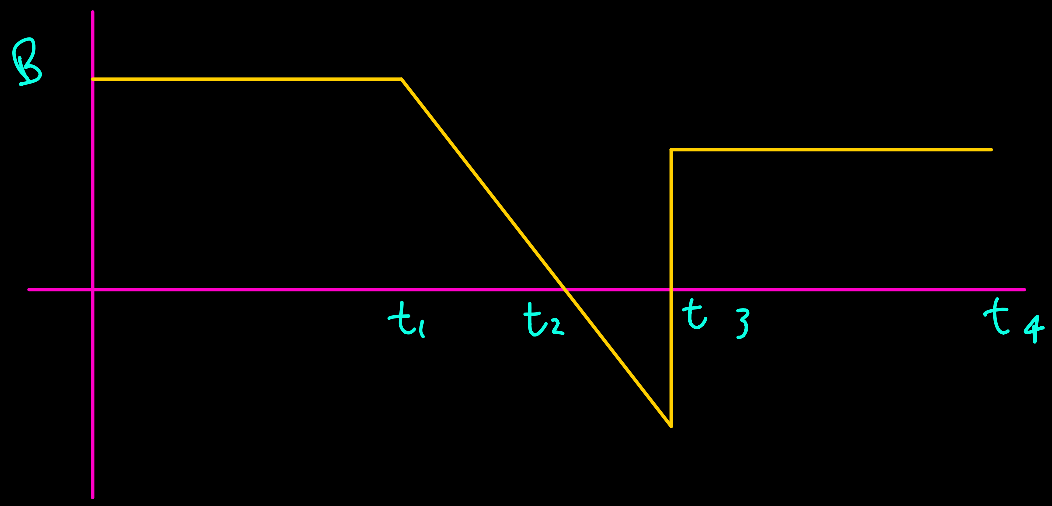
if the change of Φ is like this...



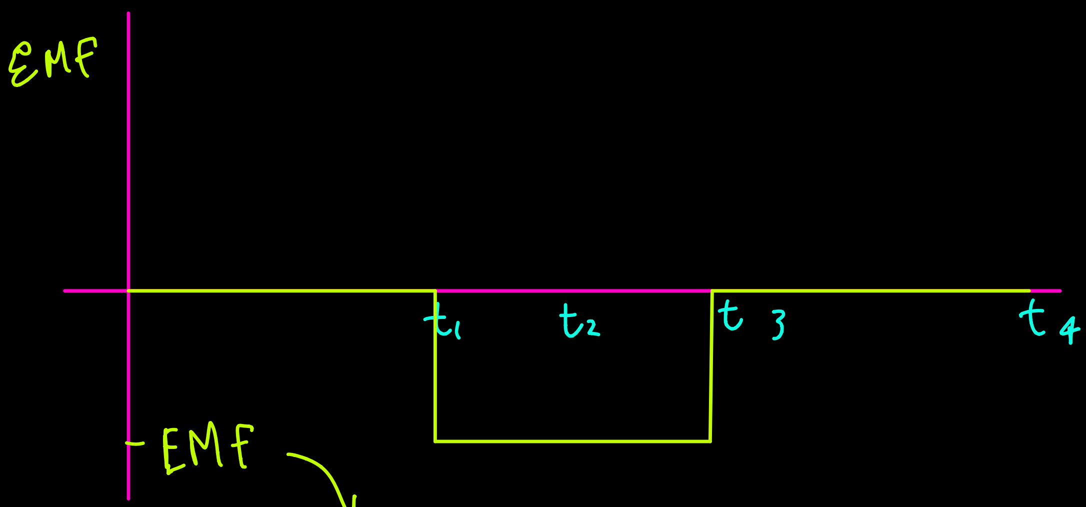
then change of EMF is like this...



if the change of B is like this



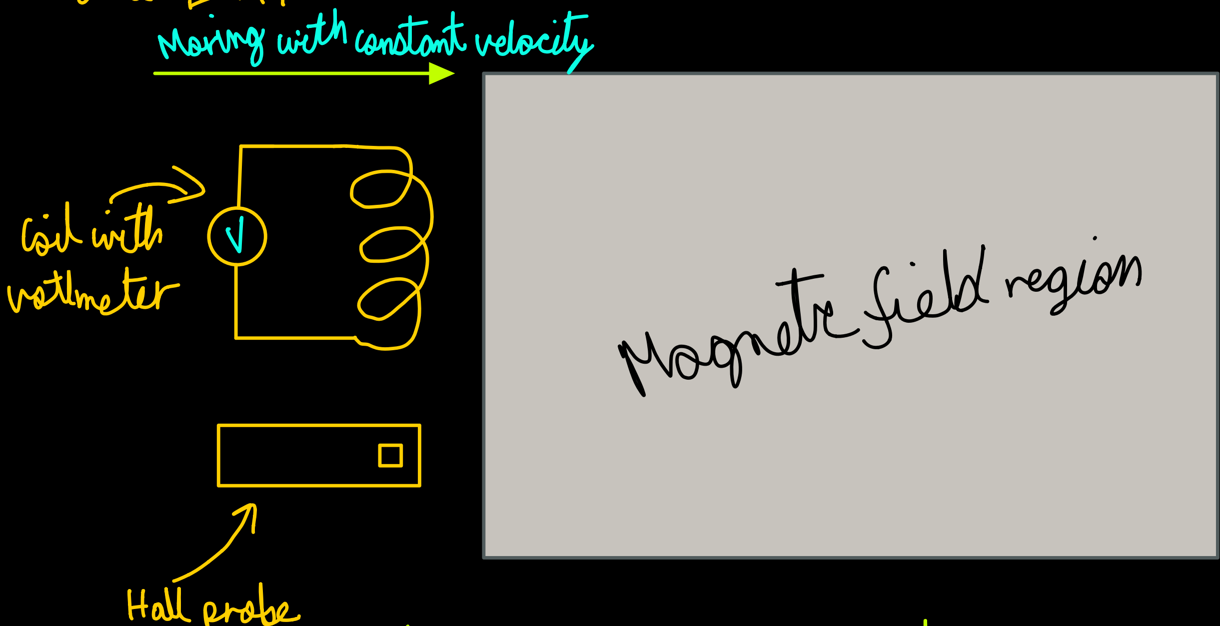
$$EMF = \frac{dB}{dt}(NA)$$



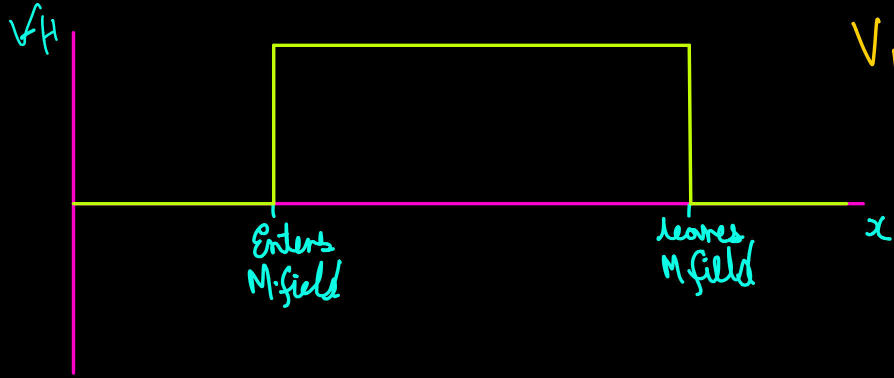
gradient $(t_1 - t_3) \times Na = EMF$

Lenz's Law

- It tries to oppose the change which induces the EMF

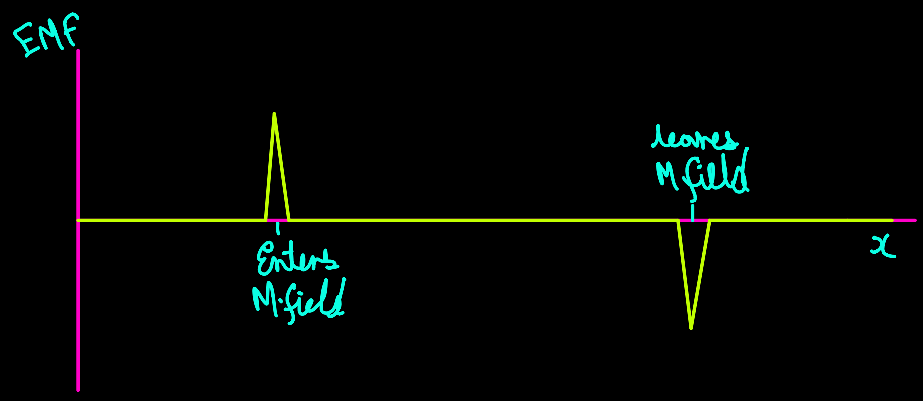


Graph of Hall voltage produced in Hall probe with displacement



$$V_H = \frac{BI}{net}$$

Graph of EMF induced in coil with displacement



- If current in a wire is anticlockwise, then the north of that solenoid is on the side where magnet is being put in.