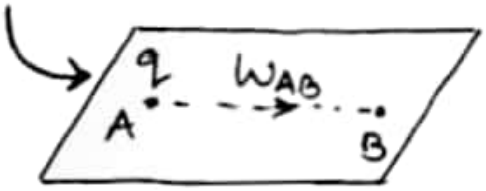
Equipotential Surfaces

That surface at every point of which electric potential is the same is called an equipotential surface.

(i) No work is done on moving the test charge from one point to the other on equipotential surface.

Equipotential Surface



$V_A = V_B$

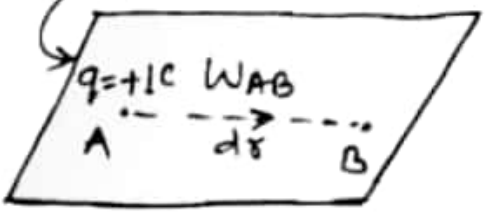
by $\frac{W_{AB}}{q} = V_B - V_A$

$\frac{W_{AB}}{q} = 0$

$\boxed{W_{AB} = 0}$

(ii) The equipotential surface through a point is normal to the electric field at that point.

Equipotential Surface



$V_A = V_B$

$W_{AB} = 0$ — ①

Also $W_{AB} = \vec{F} \cdot d\vec{r}$

$W_{AB} = F dr \cos\theta$

Here $q = +1C$ so that

by $\vec{F} = q\vec{E}$ $\quad \vec{F} = \vec{E}$

Hence $W_{AB} = E dr \cos\theta$ — ②

by eq. ① and ②

$E dr \cos\theta = 0$

$\theta = 90^\circ$

* The equipotential surface of a single point charge are concentric spherical surfaces centred at the charge.

* For a uniform electric field say along x-axis, the equipotential surfaces are planes normal to the x axis.