Relation b/w W_{ext}, W_{el}, V & ΔV of $(E-V)$

$\therefore$ $W_{ext} = V_f - V_i = \Delta V$

$W_{ext} = qV_f - qV_i = q\Delta V$

$\boxed{W_{ext} = -W_{elec}}$

$W_{elect} = -\Delta V$

$\boxed{W_{elect} = V_i - V_f}$

$\Rightarrow \vec{E} = -\frac{\partial V}{\partial x}\hat{i} - \frac{\partial V}{\partial y}\hat{j} - \frac{\partial V}{\partial z}\hat{k}$

$\boxed{\vec{E} = -\frac{\partial V}{\partial x}\hat{i}}$

$\ominus$ slope V-r graph gives value of electric field

D. ↳ Relation b/w Electric field & Potential

$$E = -\frac{dV}{dx}$$

$$\Rightarrow \int dV = -\int E\,dx$$

$$\Delta V = -\int E\,dx$$

$$\boxed{\Delta V = -E \cdot d}$$

$$V_f - V_i = -E\,d$$

$$\boxed{V_f = V_i - E\,d}$$

If electric field is uniform (in direction of electric)

$$\Delta V = -E \int_{x_i}^{x_f} dx = -E\,[x]_{x_i}^{x_f}$$

$$\Delta V = -E\,[x_f - x_i]$$

$$\boxed{\Delta V = -E\,d}$$

Case I When we move in direction of electric field

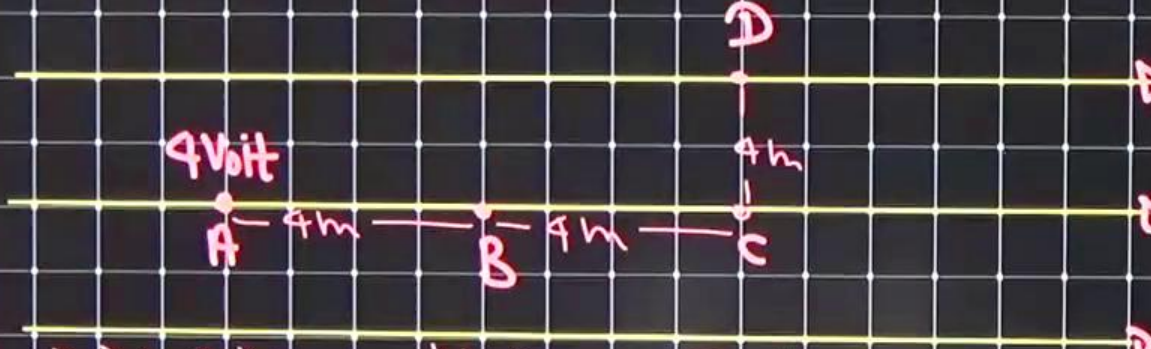
$\Delta V = -E d \cos\theta$

$\theta = 0°$

$\cos 0 = 1$

$\Delta V = -E d$

$E = -\frac{\partial V}{\partial x}$



(i) $V_A > V_B > V_C$

(ii) $V_A < V_B < V_C$

(iii) $V_A > V_B > V_C > V_D$

(iv) N.A.

$V_C - V_A = -E d$

$V_C - V_A = -5 \times 8$

$V_C - V_A = -40$

$V_C = V_A - 40$

$= 4 - 40$

$V_C = -36$ Volt

$V_B - V_A = -5 \times 4$

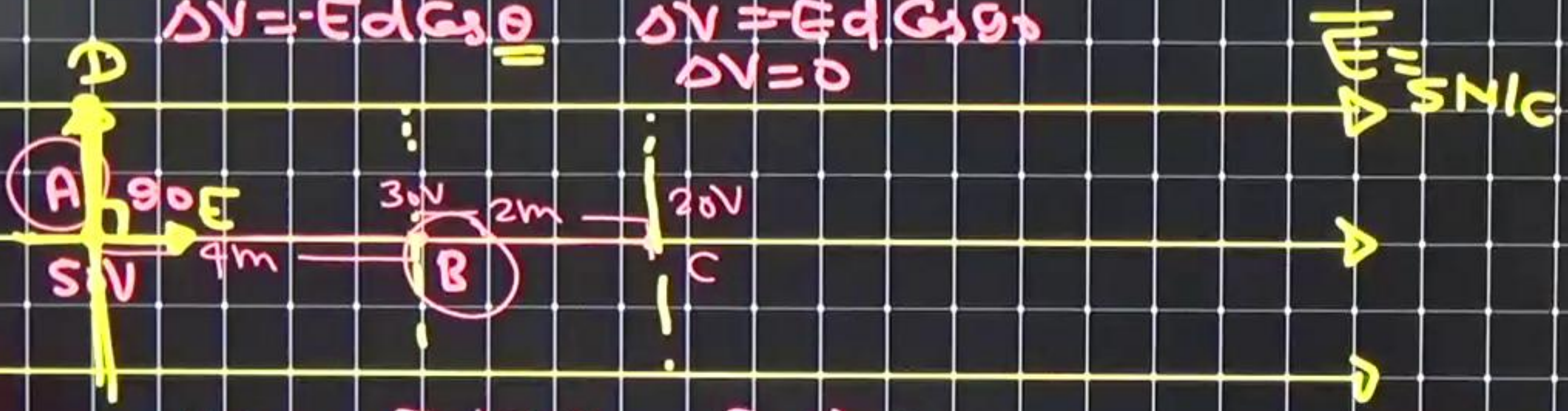
$V_B - V_A = -20$

$V_B = V_A - 20 = 4 - 20 = -16$ Volt

① Find Potential at Point B.

$\Delta V = -E d \cos\theta$ $\Delta V = -E d \cos 90$

$\Delta V = 0$



$\Delta V = -E d \cos\theta$

$V_B - V_A = -5 \times 4$

$V_B - V_A = -20$

$V_B = V_A - 20$

$= 50 - 20 = 30V$

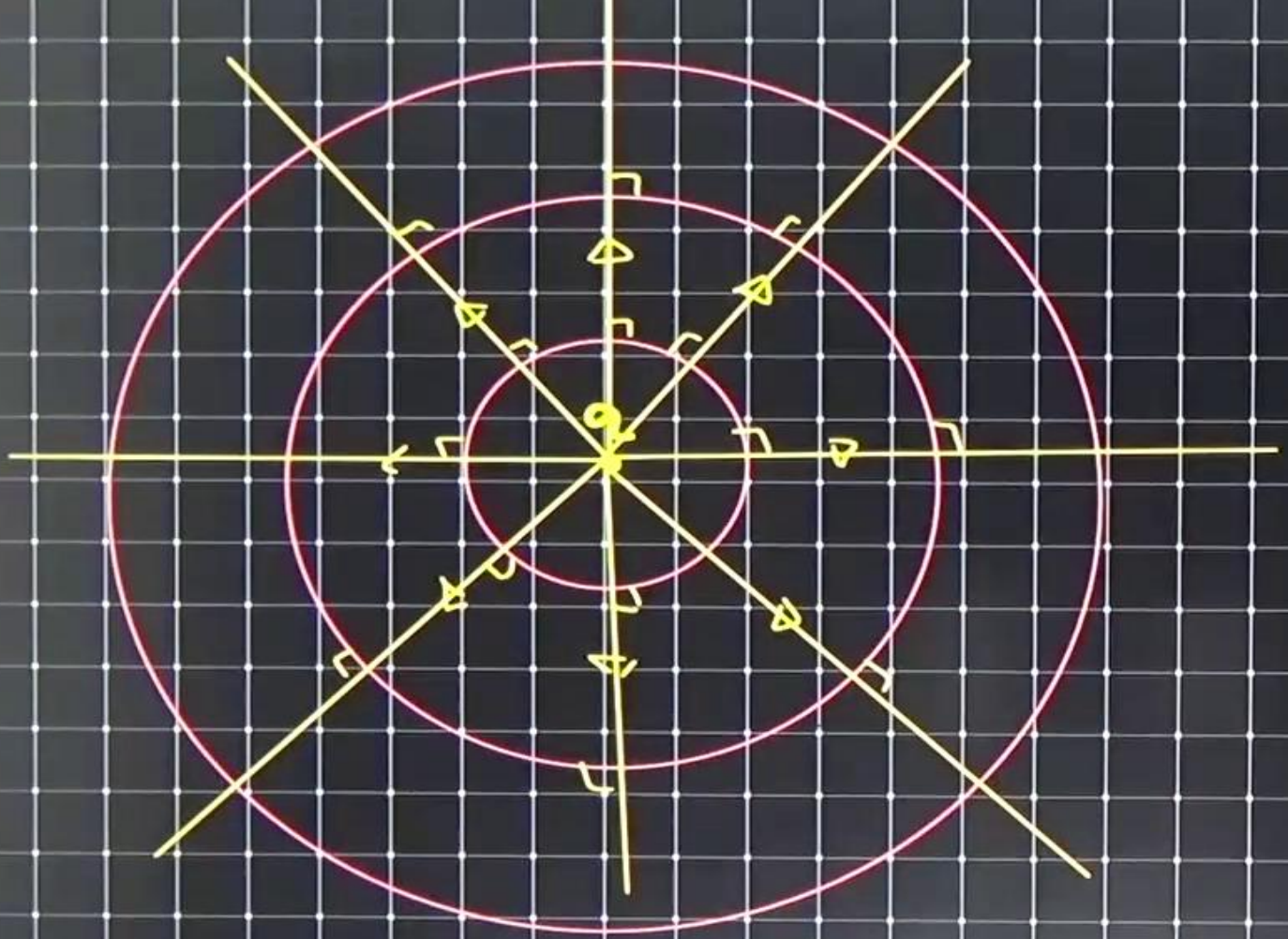
$\cos 0^\circ = 0$

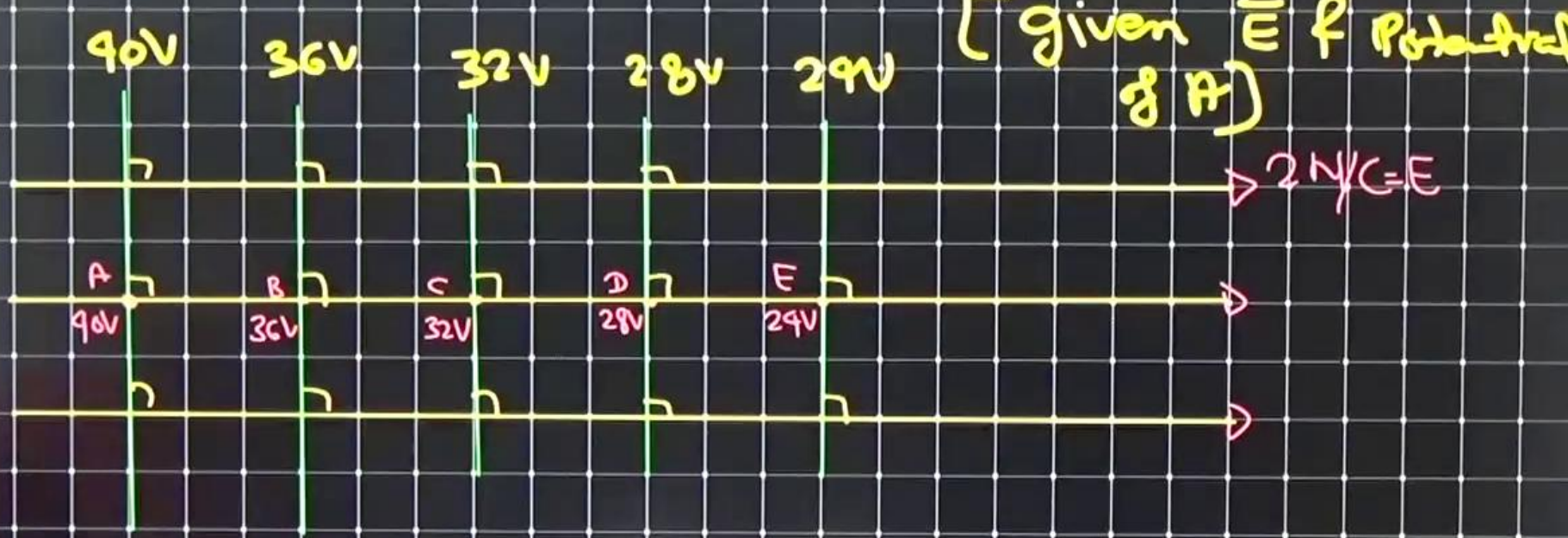
$\Delta V = -E d \cos\theta$ θ → Angle b/w $\vec{E}$ & $\vec{r}$ or $\vec{d}$

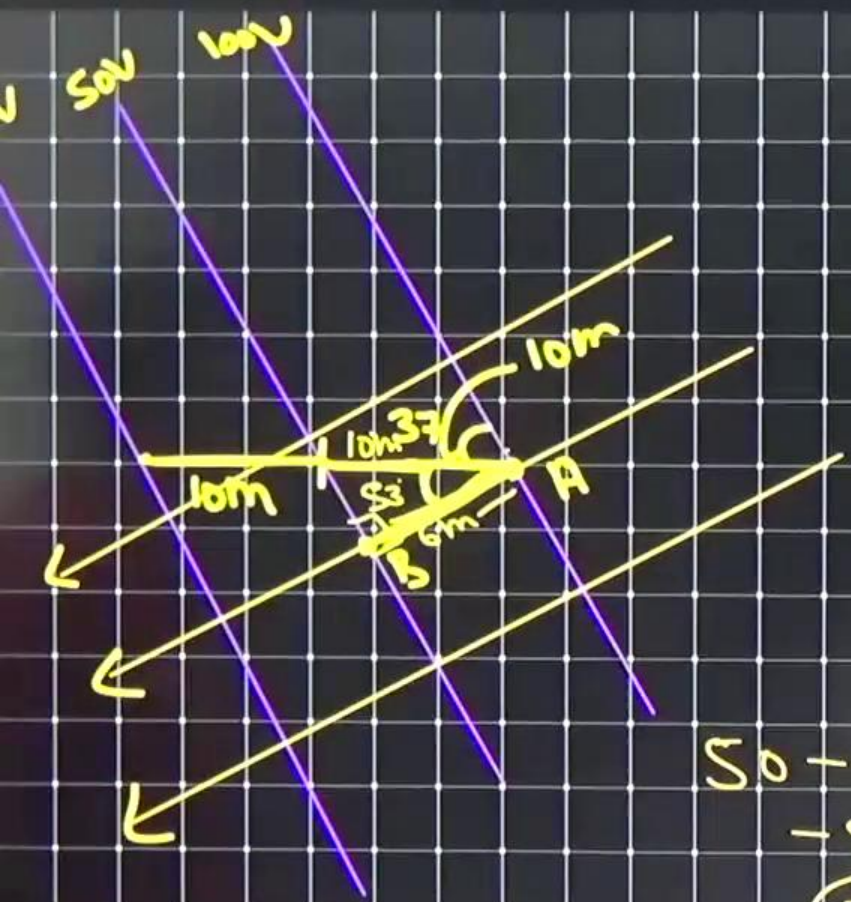
$V_C - V_B = -5 \times 2 \times \cos 0$

$V_C - 30 = -10$

$V_C = 30 - 10 = 20V$


Q


90V
36V
32V
28V
29V
[given E f
g A]
2 N/C=E
A
B
C
D
E
90V
36V
32V
28V
29V



We move from A to B

$\Delta V = -E d \cos\theta$

$V_B - V_A = -E \times 6 \cos 0$

$\cos 53° = \frac{AB}{10}$

$\frac{3}{5} = \frac{AB}{10}$

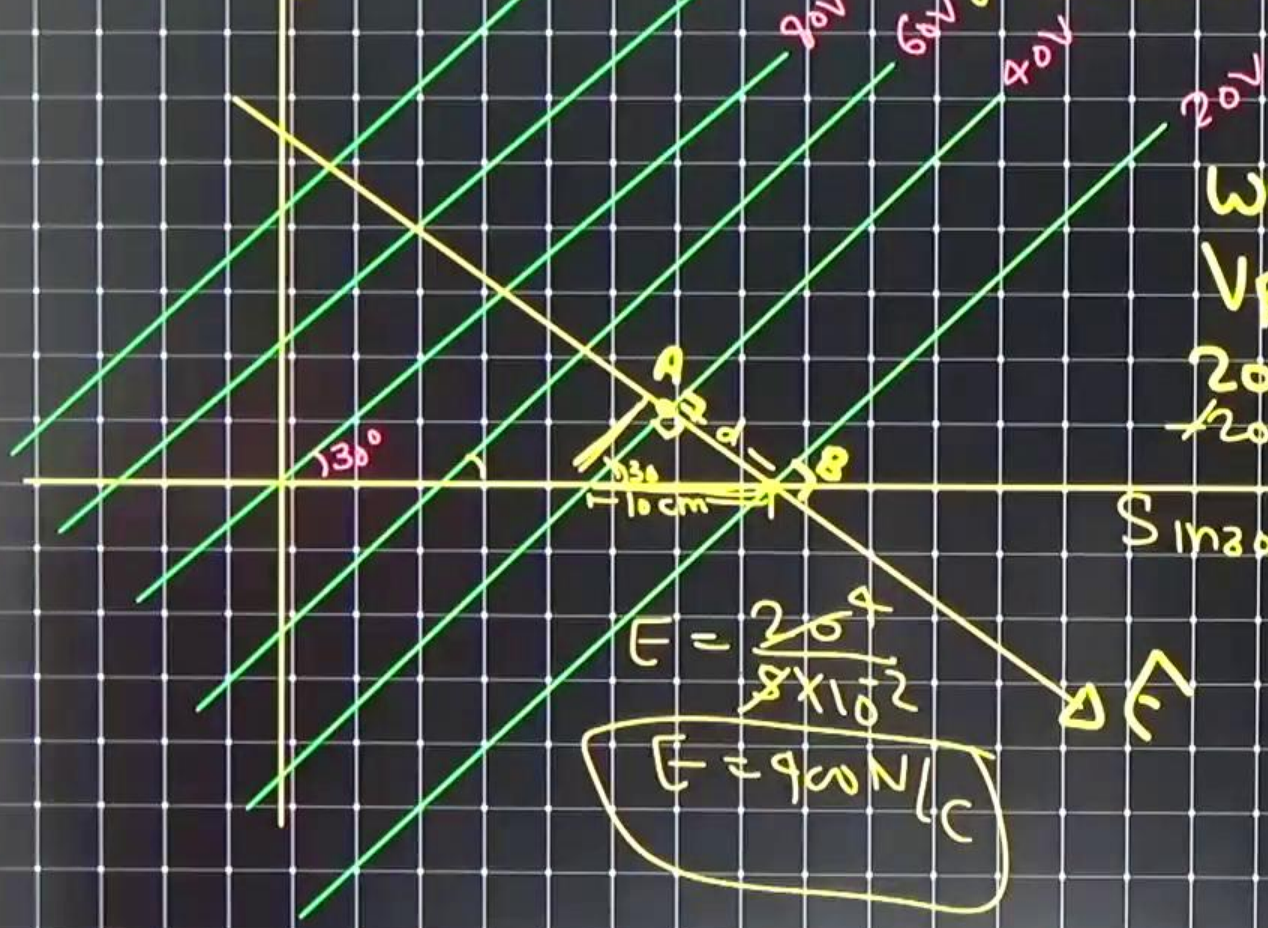
$AB = 6m$

$50 - 10 = -E \times 6$

$-50 = -E \times 6$

$E = \frac{50}{6} = \frac{25}{3} N/C$

Find Value of electric field & also find $\vec{E}$.



We move from A to B.

$V_B - V_A = -E \times d$

$20 - 40 = -E \times 5 \times 10^{-2}$

$-20 = -E \times 5 \times 10^{-2}$

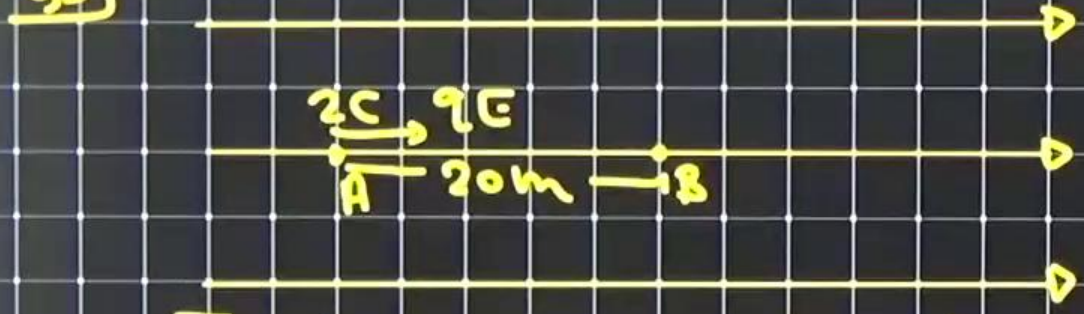
$\sin 30 = \frac{d}{10}$

$d = 10 \times \frac{1}{2} = 5\,cm$

$E = \frac{20}{5 \times 10^{-2}}$

$E = 400\ N/C$

Q3)



$W_{ext} = q\Delta V$

$W_{ele} = q[V_i - V_f]$

$W_{el} = q[V_f - V_i]$

Find work done by electrostatic force to bring a charge 2C from A to B.

$\Rightarrow$ we move from A to B

$\Delta V = -Ed$

$V_B - V_A = -20 \times 20$

$W_{ext} = q[\Delta V] = -400$ Volt

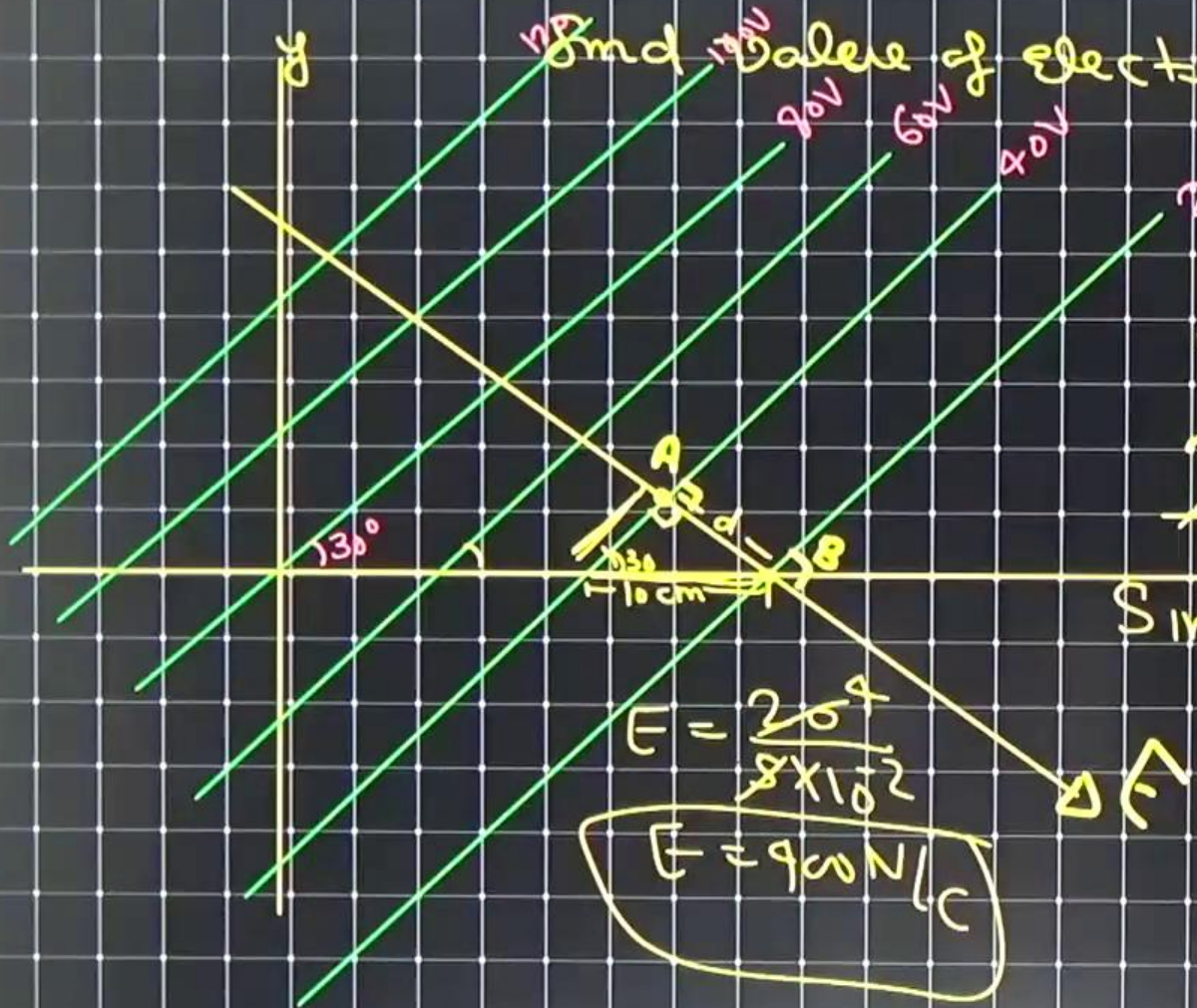
$V_A - V_B = 400$

$W_{el} = q[V_i - V_f]$

$W_{el} = 2[400]$

$\boxed{W_{el} = 800\,J}$

Find value of electric field & also find $\vec{E}$.



We move from A to B.

$V_B - V_A = -E \times d$

$20 - 90 = -E \times 5 \times 10^{-2}$

$-70 = -E \times 5 \times 10^{-2}$

$\sin 30° = \frac{d}{10}$

$d = 10 \sin 30° = 5\,cm$

$E = \frac{70}{5 \times 10^{-2}}$

$E = 1400\ N/C$