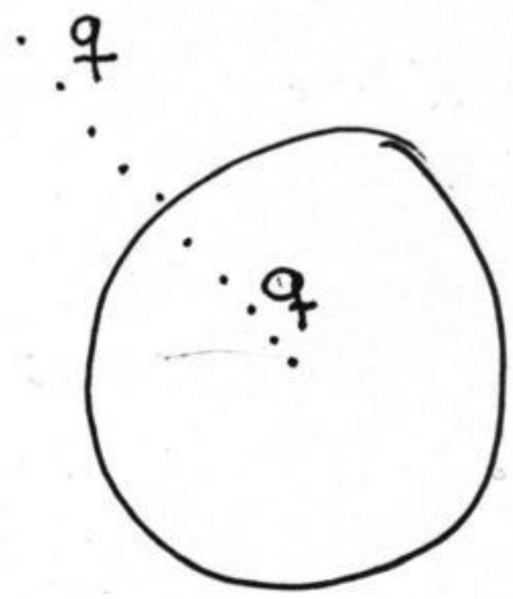
Dæmi 1 (sjá P22.43 í bók)



kúlusteel með jafndreifða hleðslu $-Q$.

a) finna kraftinn á q utan steljar

Gauß lögmálið getur ratsvíðið utan steljar í fjarlægð r frá miðju.

$$\rightarrow \bar{E} = -\frac{Q}{4\pi\epsilon_0 r^2}\hat{r}$$ ... eðlilegar útkoma

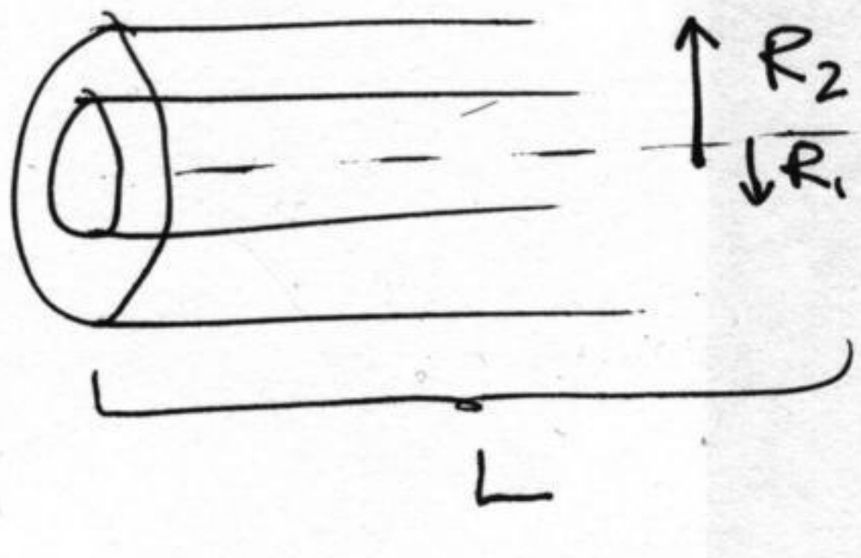
Kraftverkun á q er þá $\bar{F} = q\bar{E}$

$$\rightarrow \bar{F} = -\frac{qQ}{4\pi\epsilon_0 r^2}\hat{r}$$ eins og miðju steljar

b) Gauß $\rightarrow \bar{E} = 0$ innan steljar

$$\rightarrow \bar{F} = 0$$

Dæmi 2



Sammiðja sívalningar

$R_2 - R_1 << R_1, R_2$

langir sívalningar → getum skeppt Gaussi um enda. Gauss $\bar{E}$ hefur aðeins útpátt.

$$\oint \bar{E} \cdot d\bar{A} = \frac{Q}{\epsilon_0}$$ Hugsum yfirborð með $R_1 < r < R_2$

$$2\pi r L E = \frac{Q}{\epsilon_0} \rightarrow \bar{E} = \left(\frac{Q}{L}\right) \frac{1}{2\pi r \epsilon_0} \hat{r}$$

$$= \frac{\lambda \hat{r}}{2\pi r \epsilon_0}$$

finnum

$$V_2 - V_1 = -\int_1^2 \bar{E} \cdot d\bar{s}$$

$$\rightarrow \Delta V = -\int_{R_1}^{R_2} \frac{\lambda}{2\pi r \epsilon_0} dr = -\frac{\lambda}{2\pi\epsilon_0} \ln r \Big|_{R_1}^{R_2}$$

$$= -\frac{\lambda}{2\pi\epsilon_0} \ln\left(\frac{R_2}{R_1}\right)$$

$$Q = L\lambda \quad \text{og} \quad C = \frac{Q}{|\Delta V|}$$

$$\rightarrow C = \frac{L\lambda}{\left|-\frac{\lambda}{2\pi\epsilon_0}\ln\left(\frac{R_2}{R_1}\right)\right|}$$

$$= \frac{2\pi\epsilon_0 L}{\ln\left(\frac{R_2}{R_1}\right)}$$

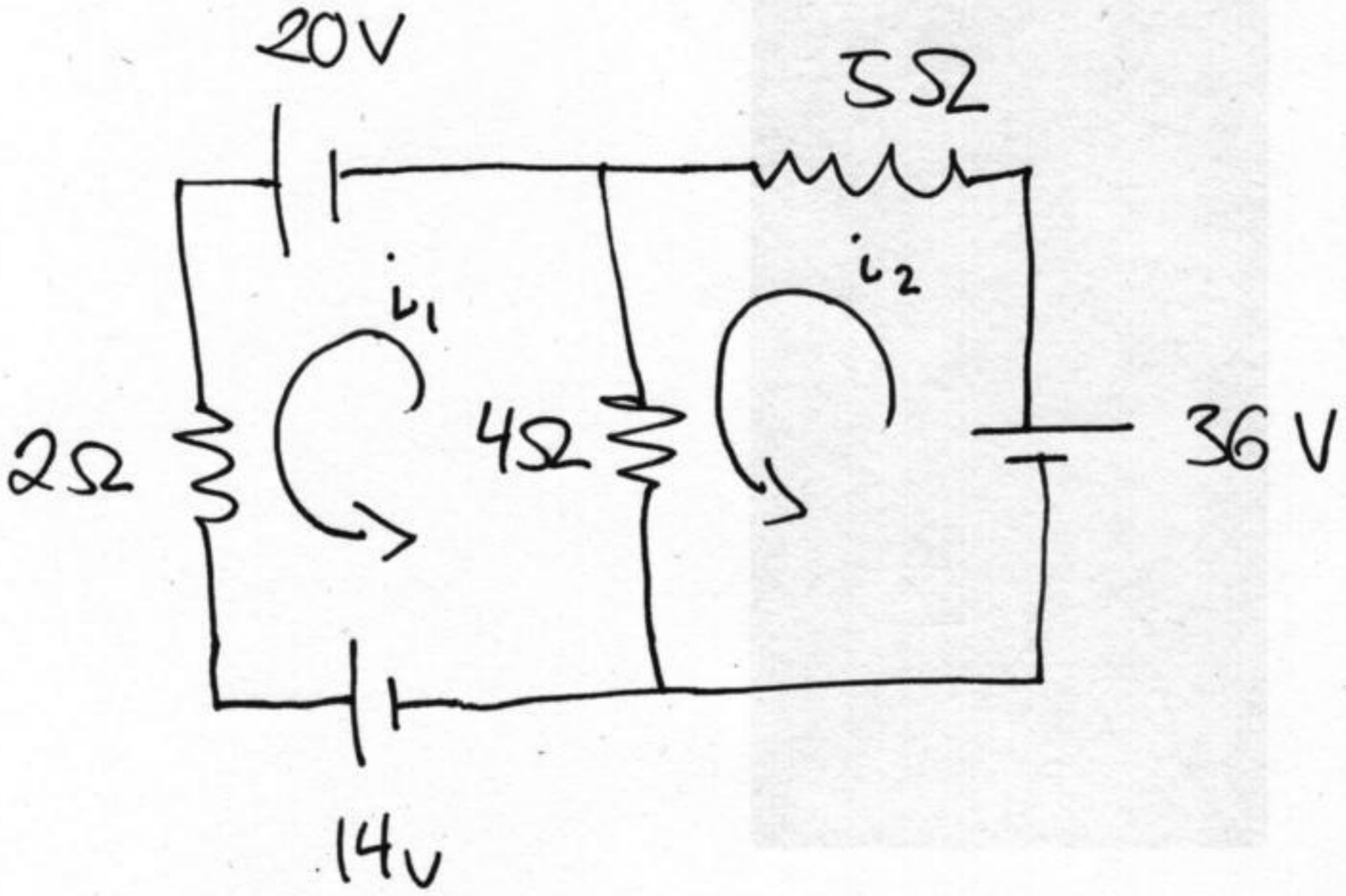
$R_2 = d + R_1$ og $d << R_1, R_2$

$$C = \frac{2\pi\epsilon_0 L}{\ln\left(\frac{R_1+d}{R_1}\right)} = \frac{2\pi\epsilon_0 L}{\ln\left(1+\frac{d}{R_1}\right)}$$

$$\simeq \frac{2\pi\epsilon_0 L}{d/R_1} = \frac{(2\pi R_1)\cdot L}{d}$$

þegar $\frac{d}{R_1} << 1$, svipar til plötu-þéttis með $C_{pl} = \frac{\epsilon_0 A}{d}$

Dæmi 4



finna straum um öll viðnám.

Nota Kirchhoff

Lykkja 1

$$20 - i_1 \cdot 2\Omega - 14 - (i_1 - i_2) \cdot 4\Omega = 0$$

Lykkja 2

$$36 - i_2 \cdot 5\Omega - (i_2 - i_1) \cdot 4\Omega = 0$$

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① : $20 - 2i_1 - 14 - 4i_1 + 4i_2 = 0$

$$-6i_1 + 4i_2 = -6$$

(2): $36 - 5i_2 - 4i_2 + 4i_1 = 0$

$$4i_1 - 9i_2 = -36$$

$$\rightarrow \quad i_1 = \frac{99}{19}\,A \approx 5{,}21\ A$$

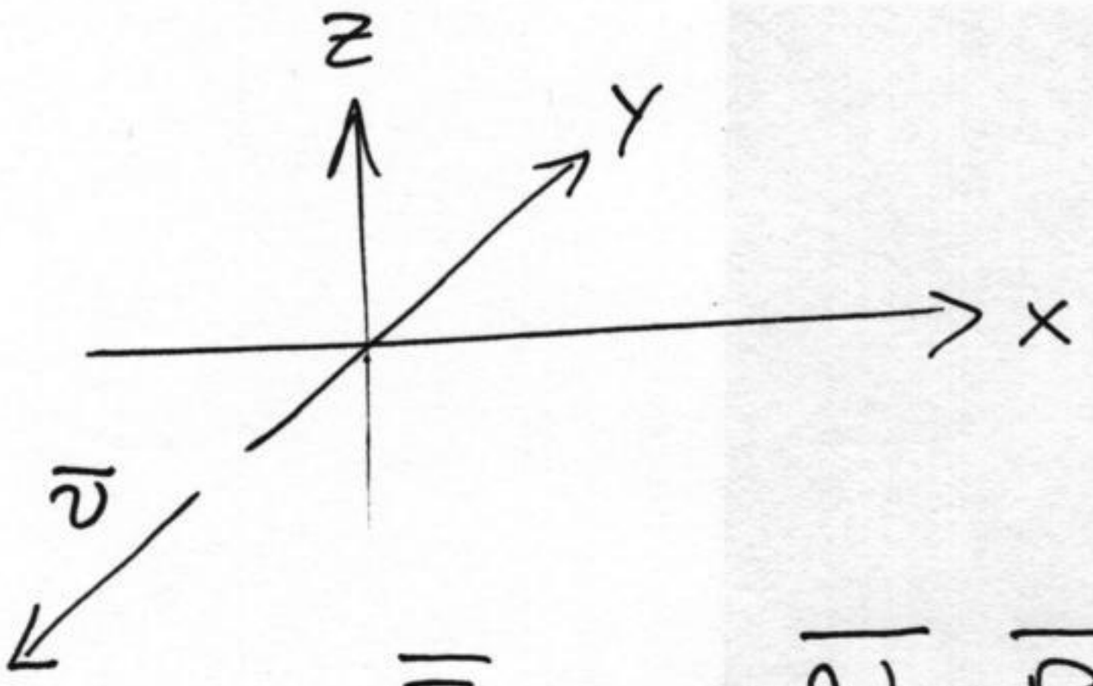
$$i_2 = \frac{120}{19}\,A \approx 6{,}32\ A$$

i_1 ca. um 2Ω.

i_2 ca. um 5Ω

$i_2 - i_1$ ca. um 4Ω

Dæmi 4



$$\bar{B} = (B_x, B_y, B_z)$$

$$\bar{v} = (0, -v, 0)$$

$$\bar{F} = q\,\bar{v} \times \bar{B}$$

$$= q\,(0, -v, 0) \times (B_x, B_y, B_z)$$

a) $$= q\,(-vB_z, 0, +vB_x) \qquad v > 0$$

b) Ef $q > 0$ $\quad F_i > 0 \quad \rightarrow$

$B_z < 0$, $B_x > 0$, B_y óákveðið

c) Ef $q < 0$ og $B_x = B_y = B_z = B > 0$

$$\bar{F} = -|q|\,(-vB_x, 0, +vB_x)$$

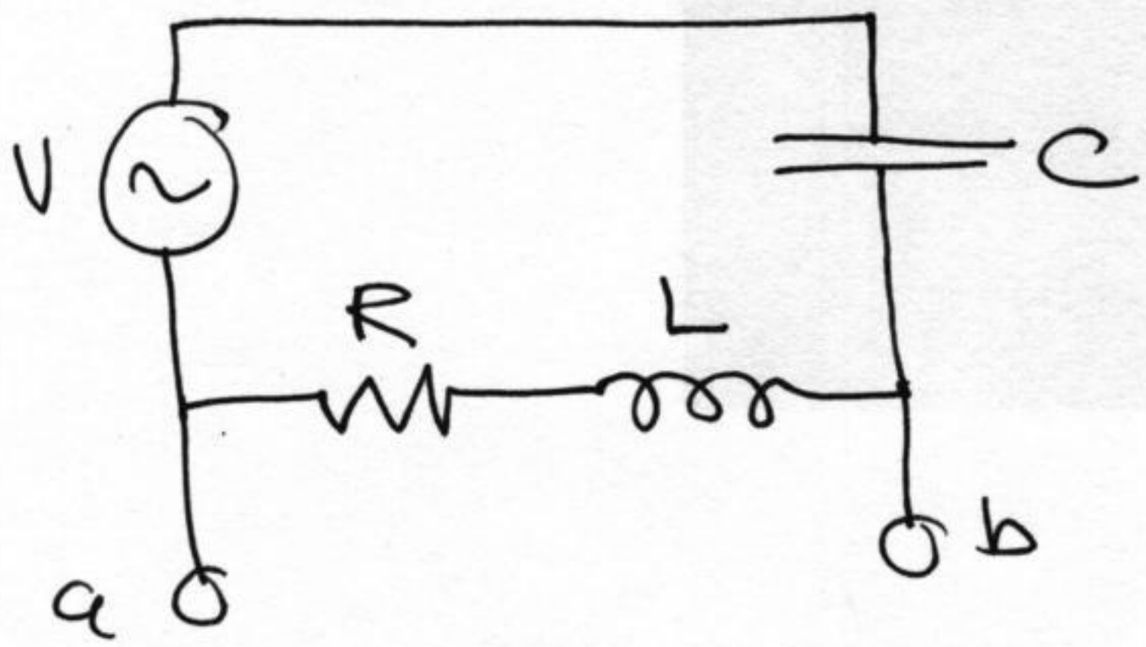
$$= -|q|vB_x(-1, 0, +1) = |q|vB_x(1, 0, -1)$$

← stefna

Lugd

$$|\bar{F}| = q^2 v^2 B_x^2 \sqrt{2}$$

Domi 5



$$V = IZ = I\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

$$V_{ab} = I X_{RL} = I\sqrt{R^2 + \omega^2 L^2}$$

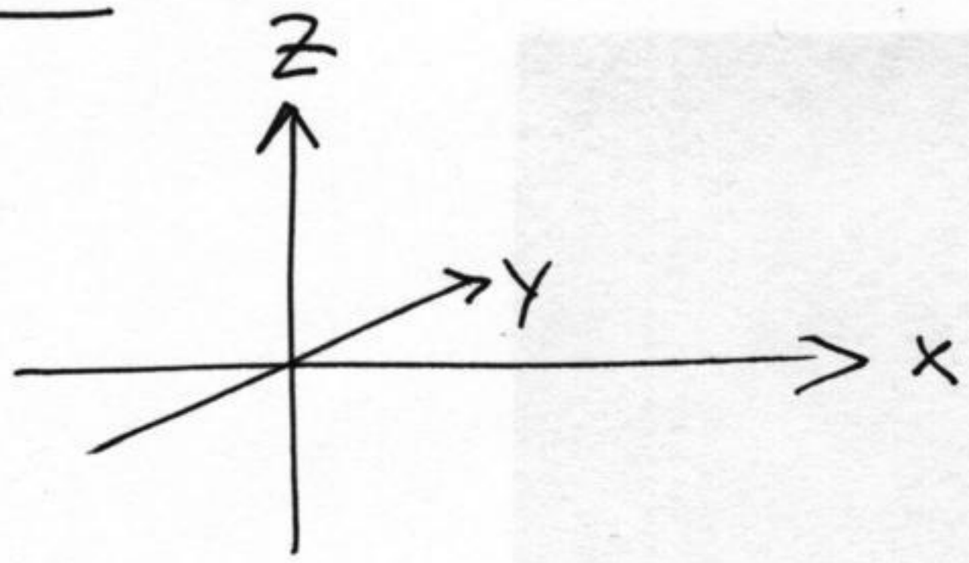
$$\frac{V_{ab}}{V} = \sqrt{\frac{R^2 + \omega^2 L^2}{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}}$$

$$\left.\frac{V_{ab}}{V}\right|_{\omega \to 0} = 0$$

hähkypiirin

$$\left.\frac{V_{ab}}{V}\right|_{\omega \to \infty} = 1$$

Domi 6



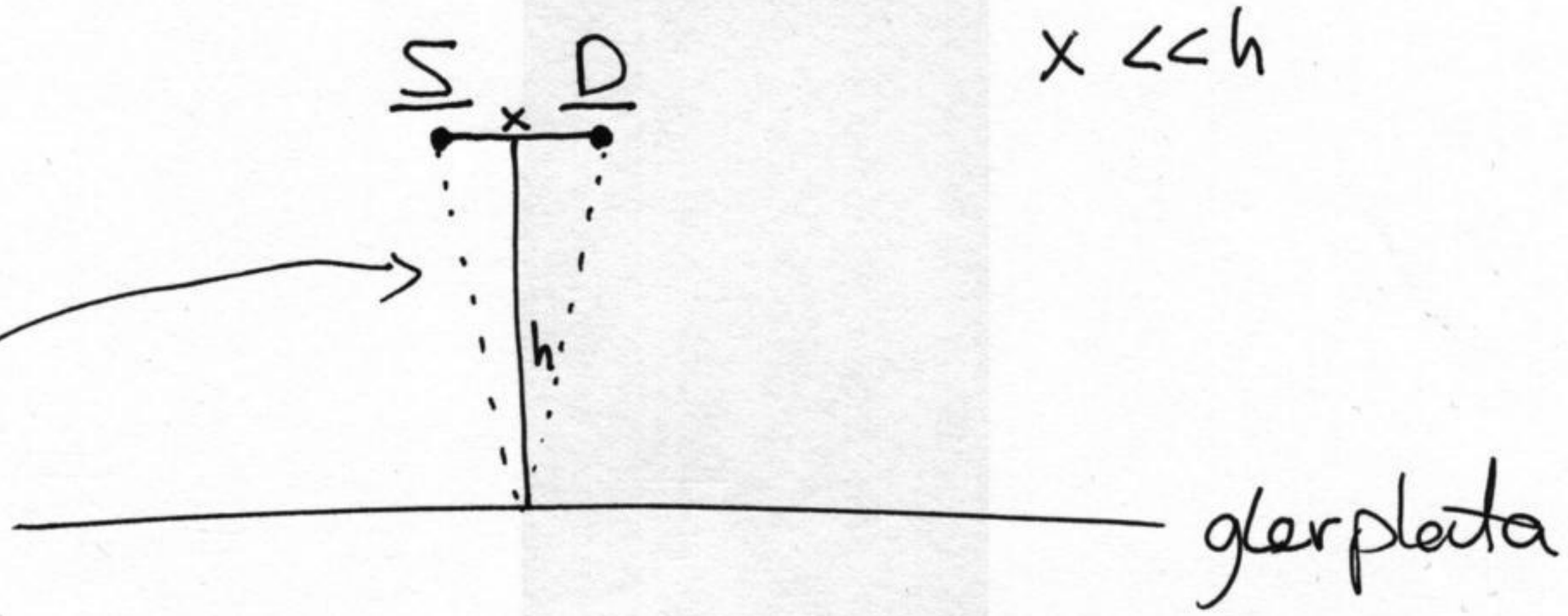
$$\bar{E} = E_0 \hat{x}$$

$$\hat{k} = \hat{z}$$

$$\bar{B} = \frac{1}{c} \hat{k} \times \bar{E}$$

$$\bar{B} = \frac{E_0}{c} \hat{z} \times \hat{x} = \frac{E_0}{c} \hat{y}$$

Dæmi 7



$x << h$

Eyðandi víxl þegar tvær leiðir r_1 og r_2 eru þ.a.

dalur í topp

$$r_2 - r_1 = \left(m + \frac{1}{2}\right)\lambda$$

r_2 er 2. langhliðin

$$2 \cdot \sqrt{\left(\frac{x}{2}\right)^2 + h^2} - x = \left(m + \frac{1}{2}\right)\lambda$$

$$\sqrt{x^2 + 4h^2} - x = \left(m + \frac{1}{2}\right)\lambda$$

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