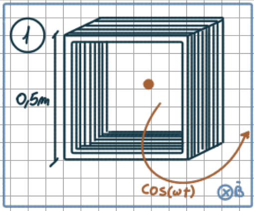
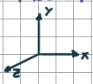
① 

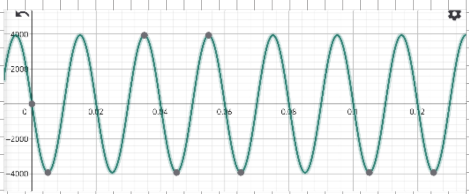
$\mathcal{E} = -N\dfrac{d\phi}{dt}$

$\bar{B} = 0{,}5T$

Busco flujo: $\phi = \int_S \vec{B}\cdot d\vec{s} = \vec{B}\cdot(0{,}5m)^2\cdot\cos(2\pi\, 50Hz\cdot t)$

$100\cdot 0{,}5T\cdot 0{,}25m^2\cdot \text{sen}(2\pi 50Hz\cdot t)\cdot 2\pi 50Hz = \mathcal{E}$

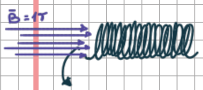
$\boxed{3926\cdot \text{sen}(2\pi\cdot 50Hz\cdot t) = \mathcal{E}}$



Fem $\longrightarrow V_{ef} = \dfrac{\text{Valor pico}}{\sqrt{2}} = \dfrac{3926}{\sqrt{2}} = \boxed{2776{,}1 = V_{ef}}$

Solo en sen y cos!

② 160 V pico  60 Hz




S → $S = 10^{-2} m^2$

OJO: No está mal pero el de la teórica dijo q' íbamos a tomar como convención el cos (xq' es la parte R)

supongo sen para simplificar cuentas

$\phi = \quad 160\cdot\text{sen}(2\pi 60Hz\cdot t) = \dfrac{d}{dt}\left(1T\cdot 10^{-2}m^2\cdot\cos(2\pi\cdot 60Hz\cdot t)\right)\cdot N$

$160\cdot\text{sen}(2\pi 60Hz\cdot t) = 10^{-2}m^2\, T\cdot 2\pi 60\cdot\dfrac{1}{s}\cdot\text{sen}(2\pi 60Hz\cdot t)\cdot N$

$160\cdot\cancel{\text{sen}(2\pi 60Hz\cdot t)} = 3{,}769\cdot N\cdot\cancel{\text{sen}(2\pi 60Hz\cdot t)}$

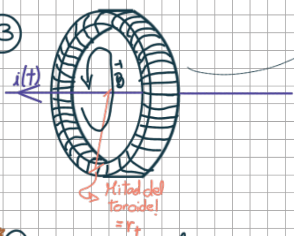
$43 \approx N$ → Con 43 espiras supero ligeramente los 160V

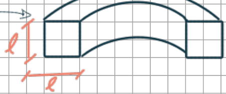
Unidades

$V = \dfrac{m\cdot N}{C}$

$T = \dfrac{N\cdot s}{m\cdot C}$

$\dfrac{m^2}{\cancel{s}}\cdot\dfrac{N\cdot\cancel{s}}{\cancel{m}\cdot C} = \dfrac{N m}{C}$ ✓

③ 


Para encontrar el campo magnético que genera el cable

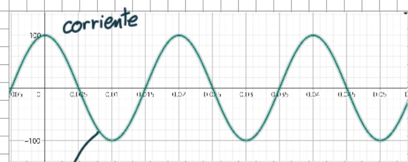
$\oint_C \bar{B}\cdot d\bar{l} = \mu_0\cdot I_{enc} \Rightarrow \bar{B}\cdot 2\pi\, \underbrace{r}_{\text{coordenadas cilíndricas}} = \mu_0\cdot\underbrace{A\cdot\text{sen}(\omega t)}_{i(t)}$

o' H' (lo tratamos como lo mismo)

$\boxed{\vec{B}(r) = \dfrac{\mu_0 A\cdot\text{sen}(\omega t)}{2\pi r}\hat{\phi}}$

Recordamos: $\text{Fem} = \mathcal{E} = -N\dfrac{d\phi}{dt}$

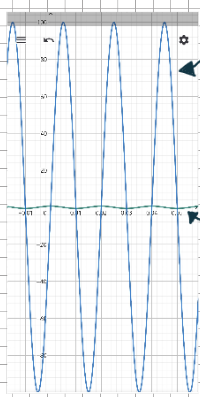
$\phi\ (\text{flujo}) = \int_S \vec{B}\,d\vec{s} = B\cdot S = \boxed{B\cdot l^2 = \text{Flujo}}$

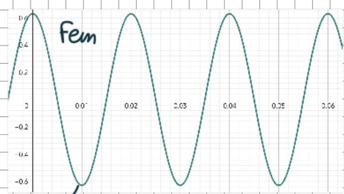


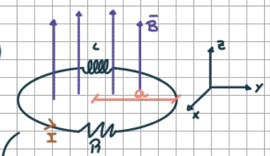

Recordar $\mathcal{E}$ = tensión ⟶ Siempre con oscilaciones/variaciones

$\mathcal{E} = \dfrac{d\left(\dfrac{\mu\cdot A\cdot\text{sen}(50\cdot 2\pi Hz)}{2\pi\cdot r}\cdot l^2\right)}{dt} = \dfrac{\overbrace{4\pi\cdot 10^{-7}}^{\mu_0}\cdot\overbrace{300}^{\mu_r}\cdot 100\cdot\overbrace{50\cdot 2\pi}^{f}\cdot\cos(50\cdot 2\pi t)\cdot\overbrace{0{,}01^2}^{l^2}\cdot\overbrace{200}^{N}}{2\pi\cdot 0{,}06}$

$\boxed{0{,}5464\cdot\cos(100\pi t) = \mathcal{E}}$

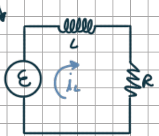





④ 


$\vec{B} = B_0\cdot e^{-t/\tau}$

$I = ?$ ⟶ La inductancia es la que define (en mayor medida) la corriente. No acepta saltos de I




$\mathcal{E} = V_L + V_R$

$\mathcal{E} = L\cdot I_L' + I_L R$

2 incógnitas

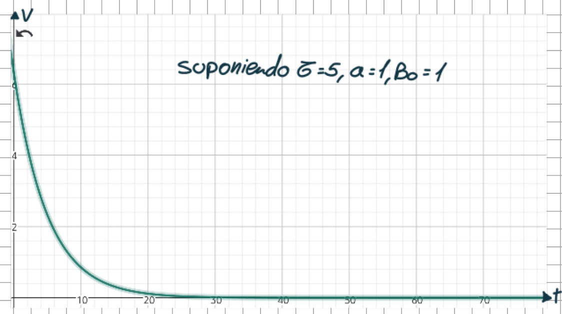
Busco flujo para encontrar $\mathcal{E}$

$\phi = \int_S \vec{B}\,d\vec{s} = B_0\cdot e^{-t/\tau}\cdot\pi a^2$

$\mathcal{E} = -N\cdot\dfrac{d\phi}{dt} = -1\cdot\pi a^2 B_0\cdot e^{-t/\tau}\cdot\left(-\dfrac{1}{\tau}\right)$

$\boxed{\mathcal{E} = \dfrac{\pi a^2 B_0}{\tau}e^{-t/\tau}}$

$$\frac{\pi a^2 B_0}{\tau} e^{-t/\tau} = L \cdot I_L' + R \cdot I_L$$

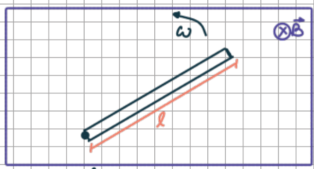



Planteo dos soluciones

Homogénea                Particular

Tengo variación de tensión V y además la inductancia pero
NO puedo usar alterna permanente xq NO lo es.

(5)



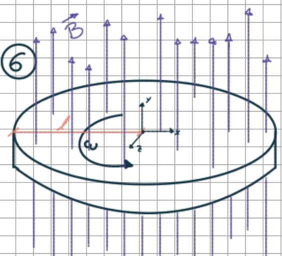

**Efecto hall**: Fenómeno en el q' se genera tensión en un conductor

Esto es ≠ a una espira q' le cambia $\bar{B}$.
Los $e^-$ experimentan $F_{Lorentz} = q(\bar{v} \times \bar{B})$

$$\phi = \iint_S \vec{B} \, d\vec{s} = B_0 \int_0^{l} \int_0^{\omega t} r \, d\phi \, dl = B_0 \cdot \omega t \cdot \frac{l^2}{2} \rightarrow \mathcal{E} = -\frac{d\phi}{dt} = \boxed{\frac{B_0 \cdot \omega \cdot l^2}{2} = \mathcal{E}}$$

$$\mathcal{E} = -N \cdot \frac{d\phi}{dt} = -B$$

(6)

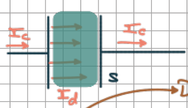



Vamos devuelta, muy similar al 5

$$\phi = \int_0^{l} \int_0^{\omega t} \vec{B} \, d\varphi \, d\vec{r} = B_0 \cdot \frac{l^2}{2} \cdot \omega t$$

$$\mathcal{E} = -\frac{d\phi}{dt} = \boxed{-B_0 \cdot \frac{l^2}{2} \cdot \omega}$$

(7)




Para esto tomamos que ∄ condición de borde      $E = \frac{\sigma}{\varepsilon_r}$ ($\sigma = \frac{Q}{s}$)      $\bar{D} = \varepsilon_r \bar{E} = \frac{\varepsilon_r \sigma}{\varepsilon_r}$

Densidad de flujo eléctrico (Campo para dieléctricos)

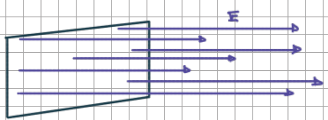
No es variable! cte

$$I_d = \oint \frac{d\bar{D}}{dt} \cdot d\bar{s} = \oint \frac{d(\sigma)}{dt} ds = \oint \frac{d\left(Q/s\right)}{dt} ds = \frac{1}{s} \oint \frac{dQ(t)}{dt} ds = \frac{dQ(t)}{dt} = I_d$$

$$I_c = \frac{dQ(t)}{dt}$$

$$I_c = I_d$$

(8) $\sigma = 0{,}5 \ S/m$ , $\varepsilon_r = 1$ , $E = 250 \cdot \text{sen}(2\pi \cdot 1GHz \cdot t) \ V/m$




Densidad de corriente de inducción, y desplazamiento?

$J = \frac{I}{A}$ (área)      $J_d = \varepsilon \frac{dE}{dt}$ → ¿Que significa esto? : Tasa de cambio temporal del campo eléctrico en un medio.
No representa un movimiento real de cargas. Sirve para explicar como $\frac{\Delta E}{\Delta t}$ genera un campo magnético

$$J_d = \varepsilon \cdot \frac{d\left(250 \cdot \text{sen}(2\pi \cdot 1GHz \cdot t)\right)}{dt} = 250 \cdot \cos(2\pi \cdot 1GHz \, t) \cdot 2\pi \cdot 1GHz$$

$$\boxed{J_d = 500\pi \cdot 1GHz \cdot \cos(2\pi \, 1GHz \, t)}$$

$$J = \frac{I}{s} = \sigma \cdot E = \left[\frac{s \cdot V}{m \cdot m} = \frac{V}{R \cdot m^2} = A\right] = 0{,}5 \frac{s}{m} \cdot 250 \cdot \text{sen}(2\pi \, 1GHz \, t) \frac{V}{m}$$

$$\boxed{J = 125 \cdot \text{sen}(2\pi \cdot 1GHz \, t)}$$

Ahora me piden la frecuencia para q las magnitudes $J = J_d$

$\Rightarrow J = J_d$

$$125 \cdot \text{sen}(2\pi \cdot f \cdot t) = 500\pi \cdot f \cdot \cos(2\pi f \cdot t)$$
$$\text{sen}(2\pi f t) = 4\pi f \cos(2\pi f t)$$

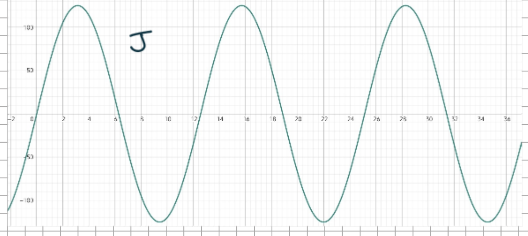
$$\frac{\text{sen}(2\pi f t)}{\cos(2\pi f t)} = 4\pi \cdot f$$

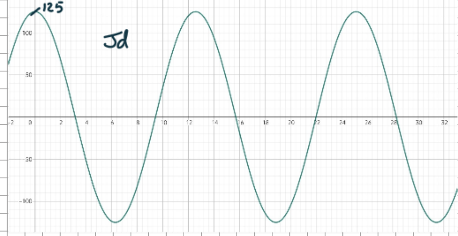
$$\tan(2\pi f t) = 4\pi \cdot f$$

Te la complicaste → $125 = 500\pi \cdot f$

$$\frac{1}{4\pi} = f$$

Ahi ya conseguimos = magnitud!!! :)



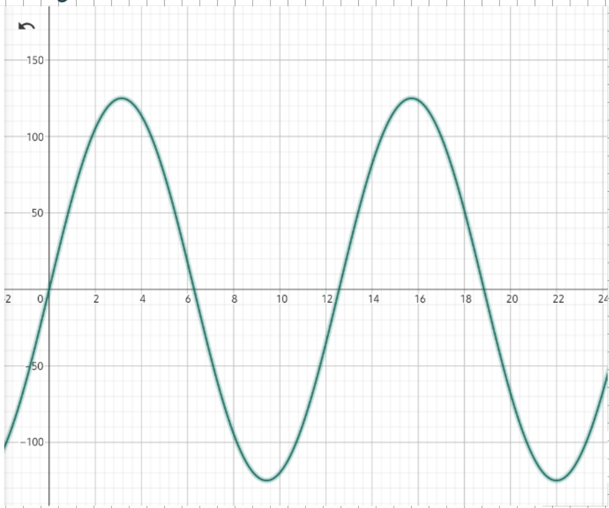



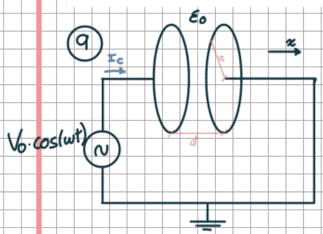

y dps podemos chequear q es un sen y un cos! pero solo estan desfasados $\pi$ ¿! $\Rightarrow$ para q' $J = J_d \ \forall t$ desfasamos

$f(x) = 500\pi \dfrac{1}{4\pi} \cos\left(\dfrac{x}{2} - \dfrac{\pi}{2}\right)$

Entrada...

con esto en $J_d$ conseguimos $J_d = J \ \forall t$! :)






pd: despreciamos efectos de borde

lo vemos como dos placas infinitas

Observamos el campo q' genera el capacitor, Ley de Gauss, tiene direccion $\hat{x}$

$$\iint_S \vec{D}\, d\vec{s} = Q_{enc} = \sigma \pi \cdot a^2$$

$$2D = \sigma$$

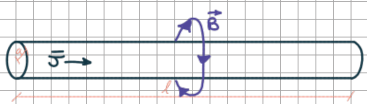
$$D = \frac{\sigma}{2} = \frac{\overbrace{q}^{=C\cdot V}}{2\pi \cdot a^2} \quad \forall \ 0 < x < d$$

$$C = \varepsilon \cdot \frac{S}{d} = \varepsilon \frac{\pi \cdot a^2}{d}$$

$$\vec{D} = \frac{\overbrace{C}^{\frac{\varepsilon_0 \cdot \pi a^2}{d}} \overbrace{V}^{V_0 \cdot \cos(\omega t)}}{2\pi \cdot a^2}\hat{x} \quad \forall \ 0<x<d = \boxed{\frac{V_0 \cdot \cos(\omega t)\, \varepsilon_0}{2d} = \vec{D}}$$

$$I = \frac{dq}{dt} = \frac{d(CV)}{dt} = \boxed{\frac{-V_0 \cdot \operatorname{sen}(\omega t) \cdot \varepsilon_0 \cdot \pi \cdot a^2}{d}\hat{x} = I}$$

10




$a \ll L$ ▸ entonces puedo aproximar a una sola dimensión

$J = J_0 \cdot \cos(\omega t)\,\hat{z}$

Utilizo Ley de Ampere

$$\oint_0^{2\pi} \bar{B}\, d\bar{l} = I_{enc} \cdot \mu_0$$

$$B 2\pi r = I \cdot \mu_0$$

$$B 2\pi r = J_0 \cdot \cos(\omega t)\, \mu_0 \cdot \overbrace{\pi \cdot a^2}^{S}$$

$$\boxed{\vec{B} = \frac{J_0 \cdot \cos(\omega t)\, \mu_0 \cdot a^2}{2r}\hat{\varphi} \quad \forall \ r > a} \quad y \quad \boxed{\vec{B} = \frac{J_0 \cdot \cos(\omega t)\, \mu_0 \cdot r}{2}\hat{\varphi} \quad \forall \ r<a}$$

a pasa a 'variable'

Calculo el campo eléctrico

$$\nabla \times E = \frac{dB}{dt}$$

divergencia, única componente derivable es $\hat{z}$

$$\frac{dE_z}{dr} = \frac{-J_0 \cdot \operatorname{sen}(\omega t)\, \mu_0 \cdot a^2 \cdot \omega}{2r}$$

$$\Rightarrow E_z = \int_r^A \frac{-J_0 \cdot \operatorname{sen}(\omega t)\, \mu_0 \cdot a^2 \cdot \omega}{2r}\, dr = \boxed{\frac{-J_0 \operatorname{sen}(\omega t)\, \mu_0 \cdot a^2 \omega}{2} \ln(A/r) = E_z} \quad \forall \ r > a$$

Mismo procedimiento $\forall r<a$

$$E_z = \int_0^r \frac{-J_0 \cdot \operatorname{sen}(\omega t)\, \mu_0 r \cdot \omega}{2} = \boxed{-J_0 \cdot \operatorname{sen}(\omega t)\, \mu_0 \omega \cdot \frac{r^2}{4} = E_z(r)} \quad \forall r<a$$

$$J_D = \frac{d\bar{D}}{dt} \rightarrow D = \frac{-J_0 \cdot sen(\omega t) \cdot \mu_0 \cdot a^2 \omega}{2} \cdot \ln(A/r)\, \varepsilon \quad r>a$$

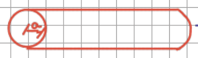
$$D = -J_0 \cdot sen(\omega t) \cdot \mu_0 \omega \cdot \frac{r^2}{4} \varepsilon \quad r<a$$

$$J_D \begin{cases} -\dfrac{J_0 \cdot \cos(\omega t) \mu_0 a^2 \cdot \omega^2 \ln(A/r)}{2} \cdot \varepsilon & r>a \\ -J_0 \cdot \cos(\omega t) \cdot \mu_0 \cdot \omega^2 \cdot \dfrac{r^2}{4} \cdot \varepsilon & r<a \end{cases}$$

---

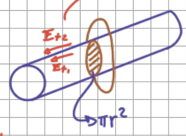
Corrección 10

$J = J_0 \cdot \cos(\omega t)$ → Volumétrico



$z$

$E_{t1} = E_{t2}$ Condición de borde




$-r \leq a$

Ley de Ampere →

$$\oint \vec{B} dt = B 2\pi r = \mu_0 I_{enc} = \mu_0 \cdot J_0 \cdot \cos(\omega t)\, \pi r^2 \Rightarrow \bar{B} = \frac{\mu_0 J_0 \cos(\omega t) r}{2} \phi$$

$$\frac{dE_z}{dr} = \frac{dB}{dt} = -\frac{\mu_0 \omega J_0 sen(\omega t)}{2} r \Rightarrow E_z = -\frac{\mu_0 \omega J_0 sen(\omega t)}{2} \int_0^x r dr^2 = \frac{-\mu_0 \omega J_0 sen(\omega t)}{2} r^2 + C \rightarrow C = \emptyset$$

$E(\emptyset) = \emptyset + C = \emptyset$

$\Rightarrow C = \emptyset$

Agora afuera

$$\frac{dE_z}{dt} = \frac{dB}{dt} = -\frac{\mu_0 \omega J_0 sen(\omega t)}{2r} a^2$$

$$E_z = -\frac{\mu_0 \omega J_0 sen(\omega t)}{2} a^2 \int r dr = -\frac{\mu_0 \omega J_0 sen(\omega t) a^2}{2} \ln(r) + C$$

$$E_z(r = a^-) = E_z(r = a^+)$$

$$C = -\frac{\mu_0 \omega J_0 sen(\omega t) a^2}{4}(1 - 2\ln(a))$$

$$E_z = -\frac{\mu_0 \omega J_0 sen(\omega t) a^2}{4}\left(1 + 2\ln\left(\frac{r}{a}\right)\right)$$

$\rightarrow -C$

CHEQUEAR