[mai 2020 ?]

Si $l = R(e)\,p^2$ "Joule losses"

alors gradient :

$$g_l = \begin{pmatrix} 2R(e)\,p \\ R'(e)\,p^2 \end{pmatrix}$$

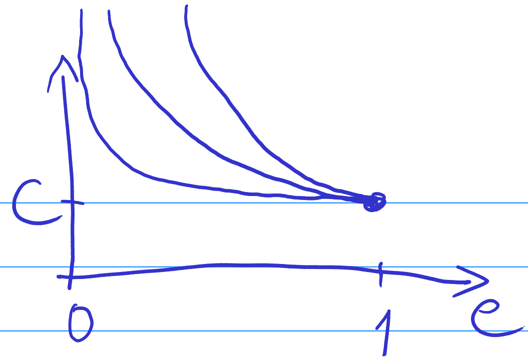
and Hessian :

$$H_l = \begin{pmatrix} 2R(e) & 2R'(e)\,p \\ 2R'(e)\,p & R''(e)\,p^2 \end{pmatrix}$$

Eigenvalues (Sympy) :

$$\lambda_{1,2} = R(e) + \frac{1}{2}R''(e)\,p^2 \pm \frac{1}{2}\sqrt{\ldots}$$

Case $R(e) = \frac{c}{e^a}$



Subcase $a = 1$:

$$\frac{\lambda_1}{c} \times e^3 = p^2 + e^2 - \sqrt{(e^2+p^2)^2} = 0$$

Subcase $a = 2$

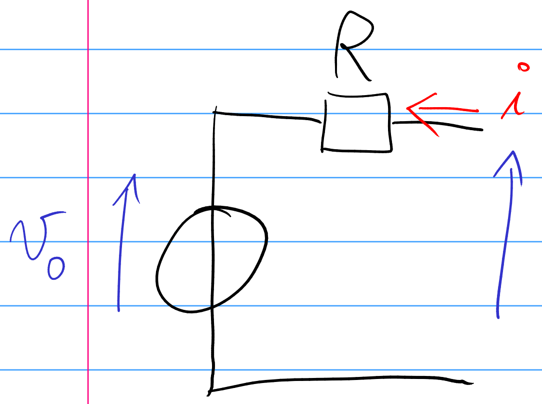
$$\frac{\lambda_1}{c} \times e^4 = 3p^2 + e^2 - \sqrt{\underbrace{9p^4 + 10e^2p^2 + e^4}_{=(3p^2+e^2)^2 + 6e^2p^2}}$$

↳ always < 0 ?

[21 juil. 2020]

Cas d'un modèle ohmique

(batt ou SuperCaps)



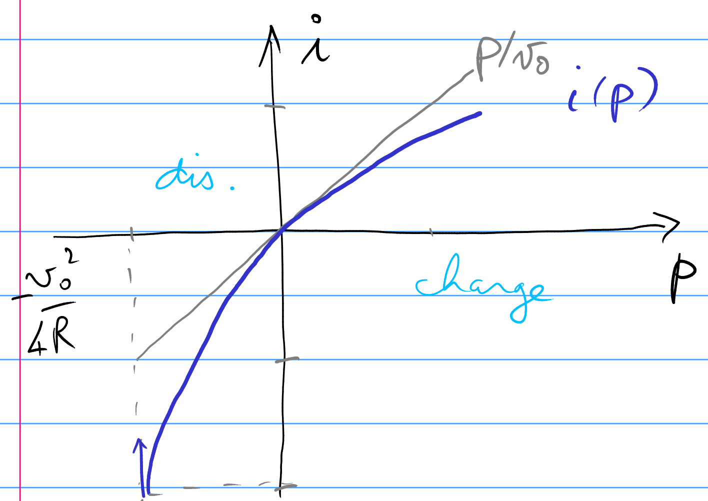
$v = v_0 + Ri$

$p = vi = v_0 i + Ri^2$

Inversion de la relation $i \to p$:

$$i = p/v_0 \, \frac{2}{1+\sqrt{1+\frac{4pR}{v_0^2}}} \quad , \quad p \geq \underbrace{-\frac{v_0^2}{4R}}_{p\ \text{disch. max.}}$$

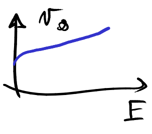
« forme x. $\frac{1}{1+\sqrt{1+x}}$ »



Questions:

- la fonction $p \mapsto p_J = Ri^2$ est-elle convexe en p ?
- p_J est-elle convexe en E → si $E = \frac{1}{2} C v_0^2$ (Sup. Cap)

  ↪ si v_0 affine en E

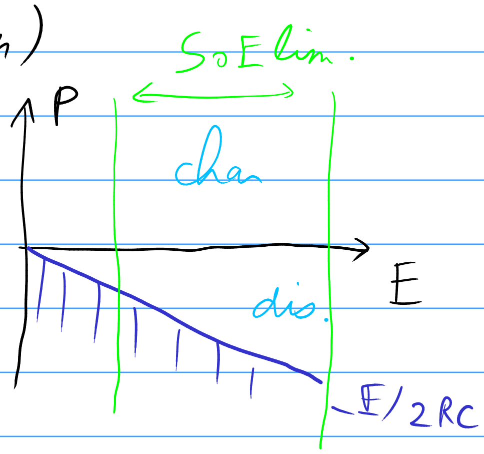


Obs : la contrainte $p \geq -\frac{v_0^2}{4R} \to -p - \frac{v_0^2}{4R} \leq 0$

- Cas $v_0 = \sqrt{\frac{2E}{C}}$ (Sup. Cap)

↳ contrainte linéaire !

$$p \geq -\frac{E}{2RC}$$



- cas $v_0 = v_{00} + aE$

$$-p - \frac{(v_{00} + aE)^2}{4R} \leq 0 \quad ?$$

non convexe ?

↳ mais ce n'est pas la vraie limite