> *restart*;

> "Puissance dissipée par la diode :"

"Puissance dissipée par la diode :" **(1)**

> $PdD := \frac{n^2 \cdot Vt^2}{R} \cdot \text{LambertW}(\text{omega}) \cdot \ln\left(\frac{Is \cdot R}{n \cdot Vt \cdot \text{LambertW}(\text{omega})} \right)$;

$$PdD := \frac{n^2\, Vt^2\, \text{LambertW}(\omega)\, \ln\left(\frac{Is\, R}{n\, Vt\, \text{LambertW}(\omega)} \right)}{R} \quad \textbf{(2)}$$

> $Vt := \frac{k \cdot T}{q}$;

$$Vt := \frac{k\, T}{q} \quad \textbf{(3)}$$

> $\text{omega} := \frac{Is \cdot R}{n \cdot Vt} \cdot \exp\left(\frac{V}{n \cdot Vt} \right)$;

$$\omega := \frac{Is\, R\, q\, e^{\frac{V q}{n k T}}}{n\, k\, T} \quad \textbf{(4)}$$

> $V := \frac{R \cdot I0}{p} + \frac{n \cdot k \cdot T0}{q} \ln\left(\frac{Is}{I0 + Is} \right)$;

$$V := \frac{R\, I0}{p} + \frac{n\, k\, T0 \ln\left(\frac{Is}{I0 + Is} \right)}{q} \quad \textbf{(5)}$$

> "Puissance évacuée par la diode :"

"Puissance évacuée par la diode :" **(6)**

> $PeD := \frac{(T - T0)}{RthD}$

$$PeD := \frac{T - T0}{RthD} \quad \textbf{(7)}$$

> "Delta puissance :"

"Delta puissance :" **(8)**

> $\text{Delta}(P) := PdD - PeD$;

$$\Delta(P) := \quad \textbf{(9)}$$

$$\frac{1}{q^2 R} \left(n^2 k^2 T^2\, \text{LambertW}\left(\frac{Is\, R\, q\, e^{\frac{\left(\frac{R\, I0}{p} + \frac{n\, k\, T0 \ln\left(\frac{Is}{I0 + Is} \right)}{q} \right) q}{n k T}}}{n\, k\, T} \right) \ln\left((Is\, R\, q) \Big/ \left(n\, k\, T\, \text{LambertW}\left(\frac{Is\, R\, q\, e^{\frac{\left(\frac{R\, I0}{p} + \frac{n\, k\, T0 \ln\left(\frac{Is}{I0 + Is} \right)}{q} \right) q}{n k T}}}{n\, k\, T} \right) \right) \right) \right) - \frac{T - T0}{RthD}$$

> $d_{\text{Delta}}(P) := diff(\text{Delta}(P), T)$

(10)

$$d_{\Delta}(P) := \qquad \textbf{(10)}$$

$$\frac{1}{q^2 R}\left(2 n^2 k^2 T \,\text{LambertW}\left(\frac{Is R q \, e^{\frac{\left(\frac{R I0}{p} + \frac{n k T0 \ln\left(\frac{Is}{I0+Is}\right)}{q}\right) q}{n k T}}}{n k T}\right) \ln\left((Is R q)\right) \Big/ \left(n k T \,\text{LambertW}\left(\frac{Is R q \, e^{\frac{\left(\frac{R I0}{p} + \frac{n k T0 \ln\left(\frac{Is}{I0+Is}\right)}{q}\right) q}{n k T}}}{n k T}\right)\right)\right) + \left(n^3 k^3 T^3 \left(-\frac{Is R q \, e^{\frac{\left(\frac{R I0}{p} + \frac{n k T0 \ln\left(\frac{Is}{I0+Is}\right)}{q}\right) q}{n k T}}}{n k T^2}\right.\right.$$

$$\left.\left. - \frac{Is R q^2 \left(\frac{R I0}{p} + \frac{n k T0 \ln\left(\frac{Is}{I0+Is}\right)}{q}\right) e^{\frac{\left(\frac{R I0}{p} + \frac{n k T0 \ln\left(\frac{Is}{I0+Is}\right)}{q}\right) q}{n k T}}}{n^2 k^2 T^3}\right)\right.$$

$$\left. \text{LambertW}\left(\frac{Is R q \, e^{\frac{\left(\frac{R I0}{p} + \frac{n k T0 \ln\left(\frac{Is}{I0+Is}\right)}{q}\right) q}{n k T}}}{n k T}\right) \ln\left((Is R q)\right) \Big/ \right.$$

$$\left(n\,k\,T\,\mathrm{LambertW}\left(\frac{Is\,R\,q\,\mathrm{e}^{\frac{\left(\frac{R\,I0}{p} + \frac{n\,k\,T0\,\ln\left(\frac{Is}{I0+Is} \right)}{q} \right) q}{n\,k\,T}}}{n\,k\,T} \right) \right) \Bigg/ \left(q^3\,R^2 \left(1 + \mathrm{LambertW}\left(\frac{Is\,R\,q\,\mathrm{e}^{\frac{\left(\frac{R\,I0}{p} + \frac{n\,k\,T0\,\ln\left(\frac{Is}{I0+Is} \right)}{q} \right) q}{n\,k\,T}}}{n\,k\,T} \right) \right) Is\,\mathrm{e}^{\frac{\left(\frac{R\,I0}{p} + \frac{n\,k\,T0\,\ln\left(\frac{Is}{I0+Is} \right)}{q} \right) q}{n\,k\,T}} \right)$$

$$+ \frac{1}{q^3\,R^2\,Is} \left(n^3\,k^3\,T^3\,\mathrm{LambertW}\left(\frac{Is\,R\,q\,\mathrm{e}^{\frac{\left(\frac{R\,I0}{p} + \frac{n\,k\,T0\,\ln\left(\frac{Is}{I0+Is} \right)}{q} \right) q}{n\,k\,T}}}{n\,k\,T} \right)^2 \left(- \frac{Is\,R\,q}{n\,k\,T^2\,\mathrm{LambertW}\left(\frac{Is\,R\,q\,\mathrm{e}^{\frac{\left(\frac{R\,I0}{p} + \frac{n\,k\,T0\,\ln\left(\frac{Is}{I0+Is} \right)}{q} \right) q}{n\,k\,T}}}{n\,k\,T} \right)} - \left(- \frac{Is\,R\,q\,\mathrm{e}^{\frac{\left(\frac{R\,I0}{p} + \frac{n\,k\,T0\,\ln\left(\frac{Is}{I0+Is} \right)}{q} \right) q}{n\,k\,T}}}{n\,k\,T^2} - \frac{Is\,R\,q^2 \left(\frac{R\,I0}{p} + \frac{n\,k\,T0\,\ln\left(\frac{Is}{I0+Is} \right)}{q} \right) \mathrm{e}^{\frac{\left(\frac{R\,I0}{p} + \frac{n\,k\,T0\,\ln\left(\frac{Is}{I0+Is} \right)}{q} \right) q}{n\,k\,T}}}{n^2\,k^2\,T^3} \right) \right) \Bigg/$$

$$\left(\text{LambertW}\left(\frac{Is\,R\,q\,e^{\frac{\left(\frac{R\,I0}{p}+\frac{n\,k\,T0\ln\left(\frac{Is}{I0+Is}\right)}{q}\right)q}{n\,k\,T}}}{n\,k\,T}\right)+1\right)\left(\text{LambertW}\left(\frac{Is\,R\,q\,e^{\frac{\left(\frac{R\,I0}{p}+\frac{n\,k\,T0\ln\left(\frac{Is}{I0+Is}\right)}{q}\right)q}{n\,k\,T}}}{n\,k\,T}\right)e^{\frac{\left(\frac{R\,I0}{p}+\frac{n\,k\,T0\ln\left(\frac{Is}{I0+Is}\right)}{q}\right)q}{n\,k\,T}}\right)-\frac{1}{RthD}$$

> $n := 1; k := 1.381 \cdot 10^{-23}; Is := 10^{-12}; q := 1.602 \cdot 10^{-19}; p := 10; I0 := 2; T0 := 25 + 273;$ $RthD := 350;$

$$n := 1$$
$$k := 1.381000000\ 10^{-23}$$
$$Is := \frac{1}{1000000000000}$$
$$q := 1.602000000\ 10^{-19}$$
$$p := 10$$
$$I0 := 2$$
$$T0 := 298$$
$$RthD := 350 \quad \textbf{(11)}$$

> $solve(dPdD < 0)$

$$RealRange(-\infty, Open(0)) \quad \textbf{(12)}$$

>