

$$3/ \mu_T = 25 \text{ mV}$$

$$r_{BE} = \frac{\mu_T}{I_{B0}}$$

$$\text{avec } I_{B0} = \frac{I_{C0}}{\beta} = \frac{I_{ref}}{\beta} = \frac{1 \text{ mA}}{100}$$

$$\Rightarrow r_{BE} = 2500 \Omega$$

$$= 10 \mu\text{A}$$

$$* V_{Early} = 100 \text{ V}$$

$$r_{CE} = \frac{V_{Early}}{I_0}$$

$$\text{avec } I_0 = I_{ref} = 1 \text{ mA}$$

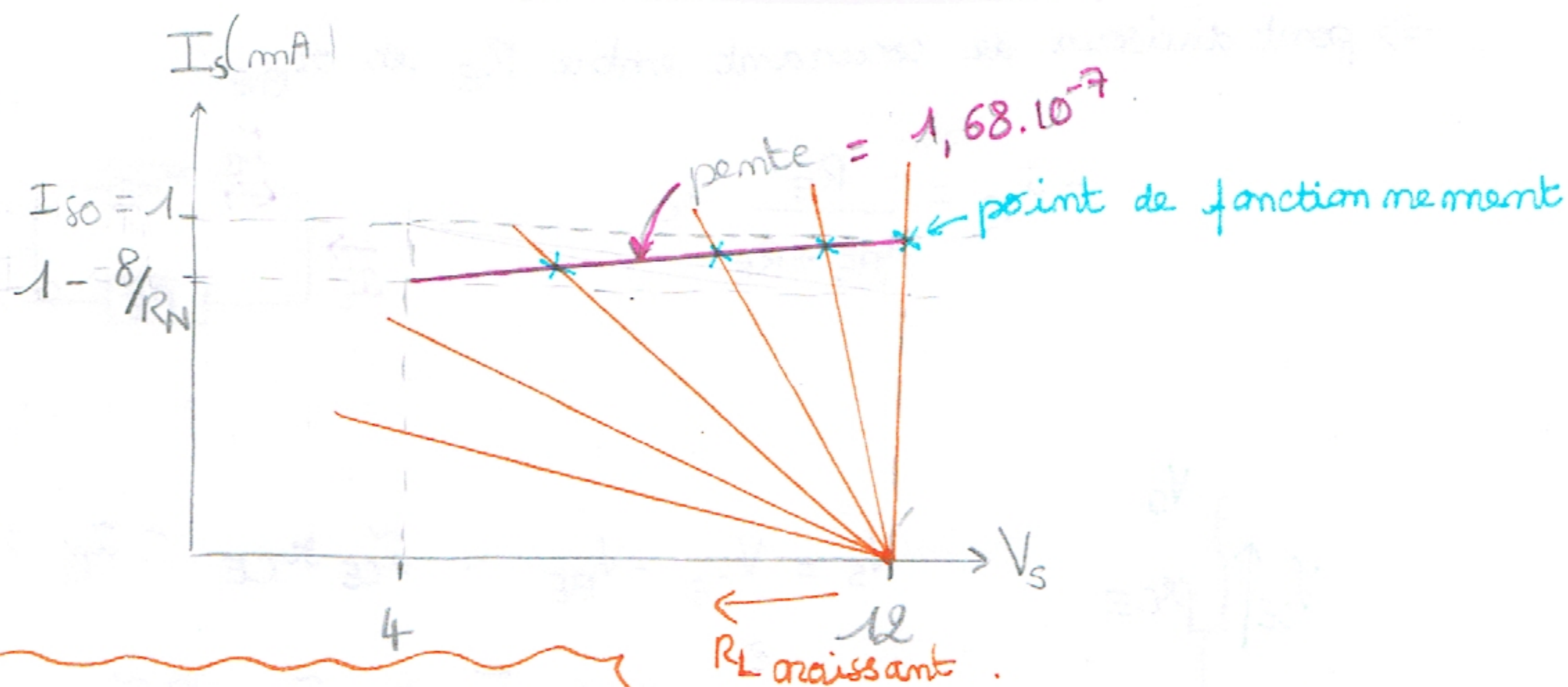
$$\Rightarrow r_{CE} = 100 \text{ k}\Omega$$

$$\Rightarrow R_N = 100 \cdot 10^3 \times \left[1 + \frac{100 \times 3500}{2500 + 3500} \right] + \frac{3500 \times 2500}{3500 + 2500}$$

$$4/ \text{pente} = \frac{1}{R_N} = 1,68 \cdot 10^{-7}$$

$$(I_{S0}, V_{S0}) = (1 \text{ mA}, 12 \text{ V})$$

$$\Rightarrow R_N = 5,935 \cdot 10^6 \Omega = 5,9 \text{ M}\Omega$$



$$I_S = \frac{V_1 - V_S}{R_L} = -\frac{V_S}{R_L} + \frac{V_1}{R_L}$$