Exercise I – Considerations around the design of a Langmuir probe?

- **A) TRIPLE PROBE: FORMULE DERIVATION**

Prove the following formula

$$T_e = \frac{e}{k\ln(2)}\left(V_+ - V_{fl}\right)$$

for the Triple probe configuration, assuming that the double probe circuit bias $\Delta V \gg T_e$.

- **B) TRIPLE PROBE WITH CORRECTION FOR SHEATH EXPANSION**
  - How is modified the previous formula when the sheath expansion is taken into account?

- **C) THE EFFECT OF THE SHEATH**
  - Prove that the presence of a sheath in front of a probe, which is biased at the floating potential, results in a limitation of the frequency response of the probe itself.
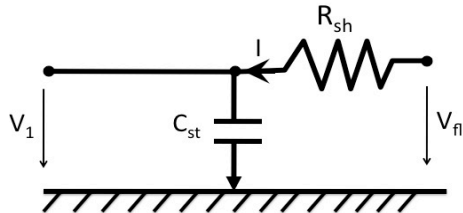
Hint: Consider a real LP whose signal is transported and acquired via a cable with a stray capacitance to the ground. A resistance and a capacitance in series can model this effect. This circuit behaves like a low-pass filter.

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Plasma diagnostics in basic plasma physics devices and tokamaks: from principles to practice – Exercise I