Special Problem 4.7-3

Bart has created a **new kind** of transistor for Springfield Elementary's science fair.

This transistor has **three terminals**, named Homer (**H**), Lisa (**L**), and Marge (**M**).

Bart has discovered in the lab that i_H (in mA) is related to v_{LM} (in volts) as:

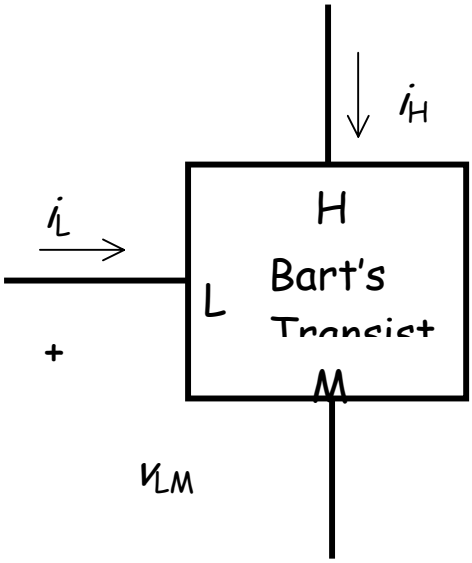
$$i_H = 3\,(v_{LM})^2 - 2\,v_{LM} \quad (mA)$$

He has also discovered that i_L (in mA) is related to v_{LM} (in volts) as:

$$i_L = 0.2\,(v_{LM})^2 + 0.3\,v_{LM} \quad (mA)$$

Note that Bart's transistor is **completley unrelated** to either a BJT or a MOSFET.

Say that Bart has placed a **DC bais voltage** between terminals L and M of V_{LM}=3.0 V.



For this bias point, determine the **numeric** values of **small-signal** parmeters g_h and r_l, that Bart has **defined** as:

$$g_h \doteq \frac{i_h}{v_{lm}} \quad \text{and} \quad r_l \doteq \frac{v_{lm}}{i_l}$$

where v_{lm} is a **small-signal voltage** and i_h, i_l are **small-signal currents**.