We wish to plot the DP characteristic of device N.
One way to approach this problem would be to decompose the given device into recognizable subelements.

\[ i = i_1 = i_4 \]
\[ V = V_1 + V_4 \]

Therefore, we just need to determine the IP characteristic of \( N_1 \) and \( N_4 \).
\[ i = i_1 = i_4 \]
\[ V = V_1 + V_4 \]
Note that it would be very useful if you can understand and derive the DP plots of $N_2$ & $N_3$ above.

Combining the DP plots of $N_2$ & $N_3$ above:

\[
\begin{align*}
  i_4 &= i_2 + i_3 \\
  v_4 &= v_2 = v_3
\end{align*}
\]
Combining DP plots of $N_1$ & $N_4$:

From the previous slide, DP plot of $N_4$:

$N_i = \frac{i}{i}$

$i = i_1 = i_4$ 

$V = V_1 + V_4$ 

Desired DP plot.
In conclusion, once you obtain the solution, ask yourself some conceptual questions:

4. Since you know how a diode works (allows current to flow in only direction etc.), does your answer make physical sense?

5. Can you obtain the DP plot via simulation using MultiSim?

   Turns out that there is a device called a curve tracer that draws I-V (DP) plots. So, you can* check your answer in MultiSim (as with any simulation, you should understand what you are doing to interpret the results).

   I have posted a MultiSim project file that verifies our solution.

   *If the DP plot is not a function, then you need to play some circuit tricks to obtain the DP plot, this is beyond the scope of this class. If you are interested, read: Hysteresis in electronic circuits: A circuit theorist's perspective. Chua, L. O. and Kennedy, M.P. Int. Journal Of Circuit. Th. And Appl. 19 (1991), pp. 471-515.