Massachusetts Institute of Technology
Department of Electrical Engineering and Computer Science
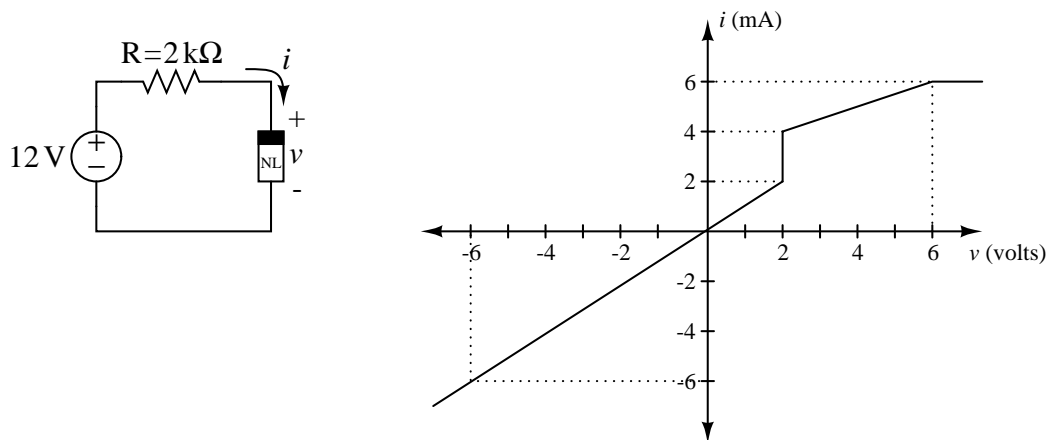
6.002 – Circuits and Electronics
Spring 2003
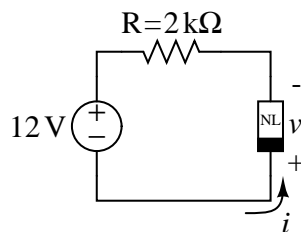
Handout S03-021 - Homework #4

Issued: Wed. Feb 26
Due: Fri. Mar 7

Problem 4.1:   The nonlinear element in the circuit below has the i-v characteristics shown in the graph.
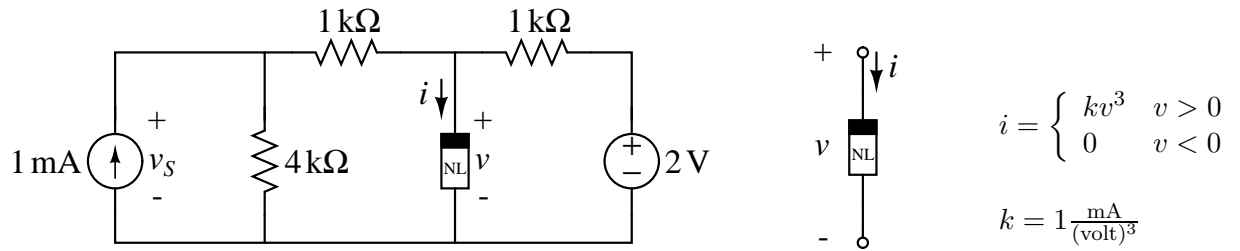
(A) Estimate values of the voltage v across and the current i through the element.

(B) Assume the nonlinear device is connected upside down as shown below. What are the values of v and i in this case?

Problem 4.2:   The circuit below contains a single nonlinear element whose i-v characteristic is indicated.

PSfrag replacements

1 kΩ   1 kΩ

1 mA v_S 4 kΩ   NL v 2 V

$+$ i

v NL

$i = \begin{cases} kv^3 & v > 0 \\ 0 & v < 0 \end{cases}$

$k = 1\frac{\text{mA}}{(\text{volt})^3}$

(A) Determine the voltage v and the current i.

(B) Determine the voltage v_S across the current source.

Hint: Think about Thevenin and/or Norton equivalent circuits.