Essentials of MOSFETs:
Lecture 1.5: Compact Models

Short Problem

Mark Lundstrom
Purdue University, Fall 2018

Assume a diode described by

$$I_D = 10^{-15}\left(e^{V_D/0.026} - 1\right) \text{ A.}$$

For the circuit in Lecture 1.5, assuming $V_{DD} = 1.0$ V, $R_1 = 1\,\text{k}\Omega$ and $R_1 = 2\,\text{k}\Omega$, KCL at node 1 gives:

$$f\left(V_1\right) = \left(1.0 - V_1\right)/10^3 - V_1/\left(2\times 10^3\right) - 10^{-15}\left(e^{V_1/0.026} - 1\right) = 0 \qquad (1)$$

For quick hand analysis, we often assume that the diode voltage is about 0.6 V. Assuming that the first guess for V_1 is 0.6 V, use Newton's method to find an improved guess.