Reading: Sections 8.1 - 8.5

Exercise 5.1: Do Exercise 1 from Chapter 8 of the notes (pages 300-301).

Exercise 5.2: Do Exercise 3 from Chapter 8 of the notes (page 301-302).

Exercise 5.3: Determine the Thevenin equivalent of the following circuit. Note that it contains a dependant source.

Problem 5.1: This problem studies the two amplifiers shown on the other side of the page. Amplifier A is a single-stage amplifier implemented with a voltage-dependent current source and a pull-up resistor. Assume that the current source parameters G and V_T satisfy G > 0 and V_S > V_T > 0. Also assume that \( RG < \frac{V_S}{V_S - V_T} \). Amplifier B is a two-stage amplifier in which each stage is identical to Amplifier A.

(A) Determine \( V_{\text{OUT}} \) as a function of \( V_{\text{IN}} \) for Amplifier A.

(B) Sketch and clearly label a graph of the input-output relation found in Part (A).

(C) Determine \( V_{\text{OUT}} \) as a function of \( V_{\text{IN}} \) for Amplifier B.

(D) Sketch and clearly label a graph of the input-output relation found in Part (C).

(E) Consider Amplifier A again. Show that the dependent current source sinks power for \( V_{\text{OUT}} > 0 \) and sources power for \( V_{\text{OUT}} < 0 \).
Dependent current sources are most often implemented with transistors that are passive devices, and hence not capable of sourcing power. In this case, the dependent current source in Amplifier A would saturate so that $v_{\text{OUT}}$ actually never goes below 0 V. That is, the current through the dependent current source becomes constant and does not increase with a further increase in $v_A$ once the voltage across the source reaches 0 V. Given this revised behavior for Amplifier A, sketch and clearly label a graph of the input-output behavior of Amplifier B for very large $G$.

**Problem 5.2:** Do Problem 5 from Chapter 8 (page 308).

**Problem 5.3:** Do Problem 9 from Chapter 8 (page 312).