Solutions Quiz #1 October 31, 2001
Show your work so that the method can be graded for correctness and completeness and all of the points do not depend on just the final numerical value.

II (20 Points) Standard Dependent Sources
a) (13 Points) For the circuit shown find \( i_{OUT}/i_s \).

\[
V_2 = -i_s (R_1 \parallel R_2)
\]

\[
V_{OUT} = g_m (R_{OUT} \parallel R_L)
\]

\[
i_{OUT} = -\frac{V_{OUT}}{R_L}
\]

b) (7 Points) Find the Thevenin resistance seen looking to the left of AA'.

The independent source \( i_s \) is turned to zero. This makes \( v_2 \) zero and in turn \( g_m v_2 \) is zero. Thus only \( R_{OUT} \) remains and is the Thevenin resistance.

II (20 Points) Logic Gates
Inputs A, B, and C have all been zero (low) for a long time and then at \( t = 0 \), A and C go to (high) for a long time.

a) (8 Points) Find the values of X and Y just before \( t = 0 \), and then as \( t \) goes to infinity.

Before \( t = 0 \),
\[
X = A + B = 0 + 0 = 0
\]
\[
Y = (X*\text{Bar}) = (0*\text{Bar}) = \text{Bar} = 1
\]
As approach infinity,
\[
X = A + B = 1 + 0 = 1
\]
\[
Y = (X*\text{Bar}) = (1*\text{Bar}) = \text{Bar} = 0
\]

b) Complete the timing diagram below assuming that each gate has a propagation delay of 2 ns before the correct output appears at its output.