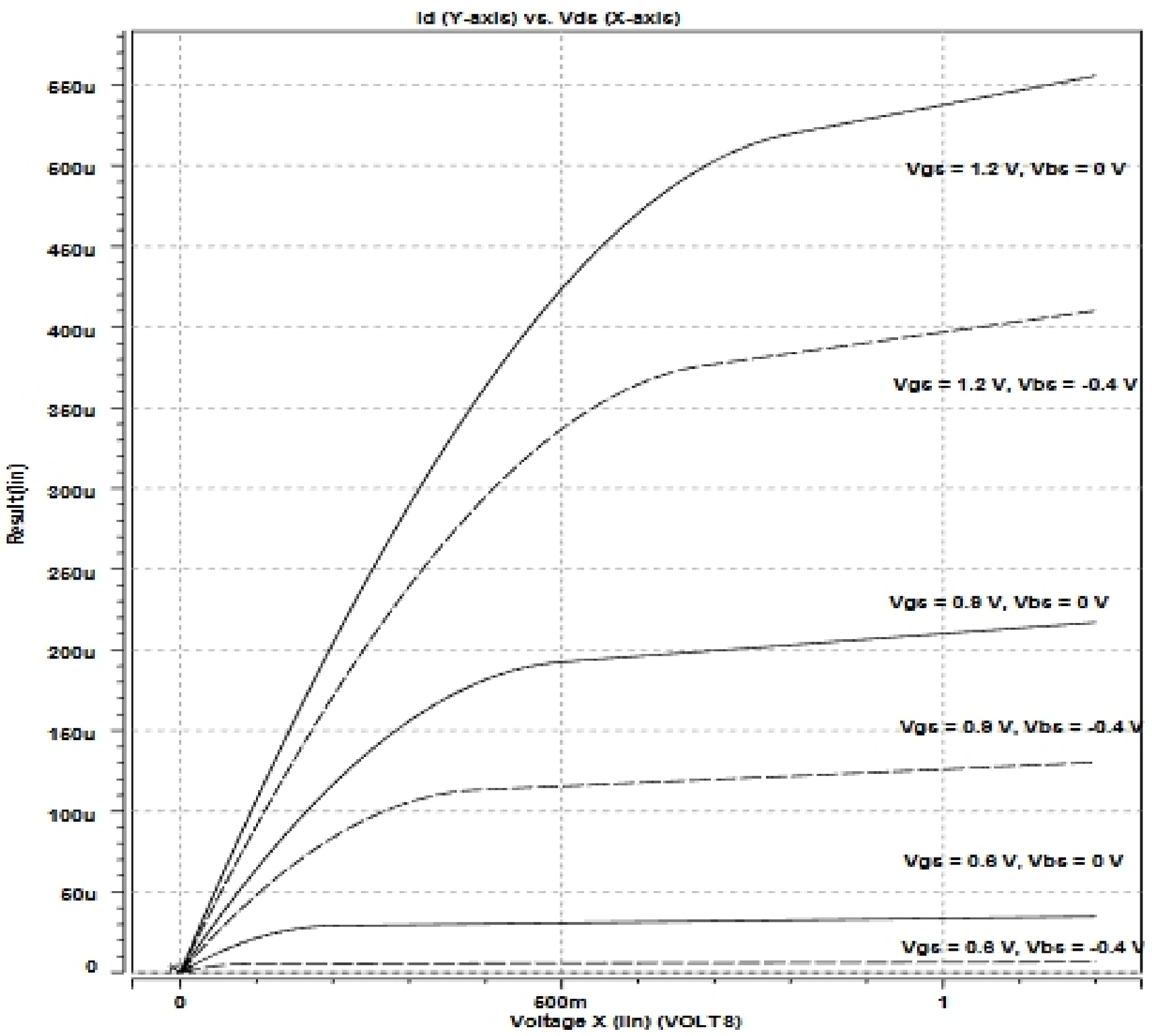
UNIVERSITY OF CALIFORNIA AT BERKELEY
College of Engineering
Department of Electrical Engineering and Computer Science

R.W. Brodersen	**Homework #1**	**EECS 140**
Mike Chen	**(Due 1/29/04)**	**Spring 2004**

1) Using the figure below, estimate the transistor model (Level 1) parameters: V_{TO}, γ, k', and λ. Assume W/L=10, φ_f=0.3V. Explain your method.

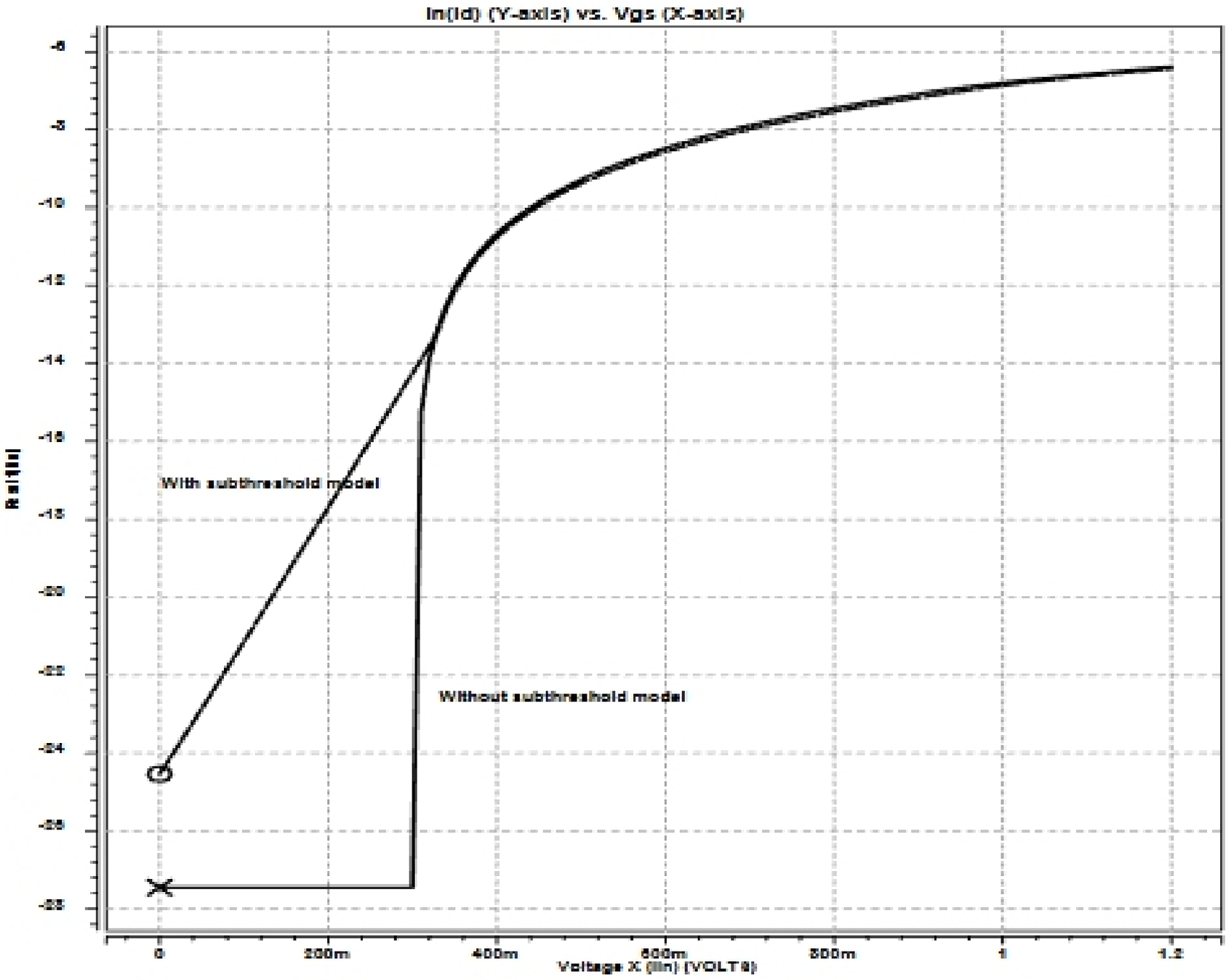


2) An NMOS transistor has the following parameters:
W=1.3 ∝m, L=0.13 ∝m, V_{TO}=0.4 V, γ=0.5 $V^{1/2}$, k'=100 ∝A/V^2, and λ=0.01 V^{-1}
Sketch gm-Vds characteristics for Vds from 0 to 1V and Vbs=0 V and –0.5 V.
Assume Vgs=1 V.

3) The figure below is the ln(Id)-Vgs characteristic with and without subthreshold modeling. Assuming the subthreshold current can be approximated with,

$I_d = I_o e^{\frac{V_{gs}-V_{th}}{nV_T}}$, $where V_T = 26mV$

Estimate the value, n, in this model.



4) Learn to run HSPICE:
   a) Setup the HSPICE environment with the following instructions:
      http://bwrc.eecs.berkeley.edu/classes/ee140/howtos.htm
   b) Copy the SPICE file (demo3.sp) to your working directory from
      http://bwrc.eecs.berkeley.edu/classes/ee140/notes.htm
   c) Execute HSPICE and Awaves:
      c199.> hspice demo3.sp >! demo3.lis
      >info: ***** hspice job concluded
      c199.> awaves &
   d) View the results from awaves:
      Load the design from **Design->Open**, and Choose the waveforms you would like to see from **Results Browser**.
   e) Print out the Id-Vgs, and gm-Vgs curves.