ECE 310 –MICROELECTRONICS I

CADENCE TUTORIAL: I-V AND PARAMETRIC SWEEPS

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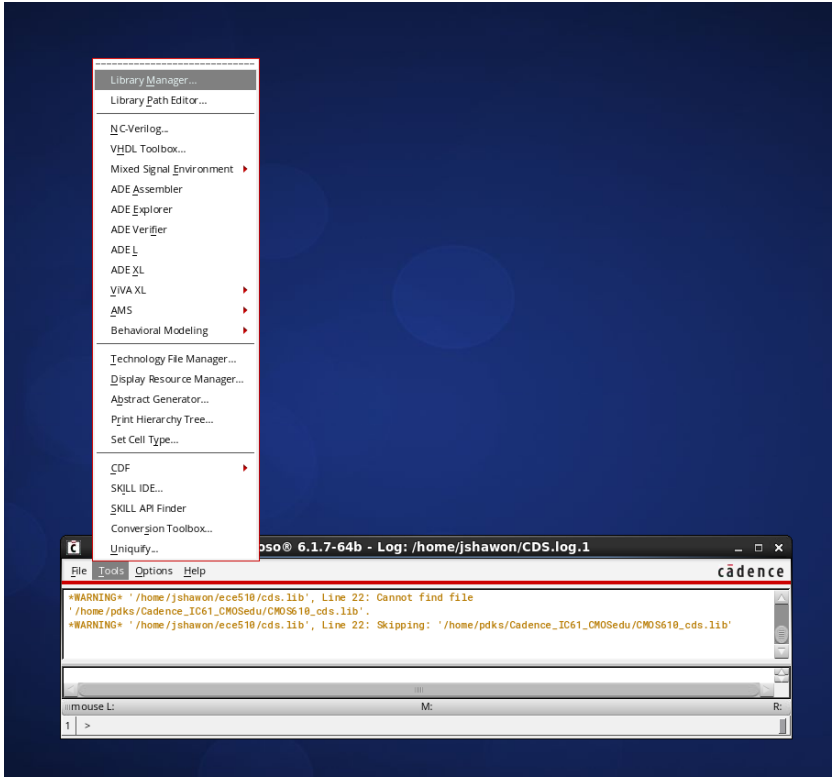
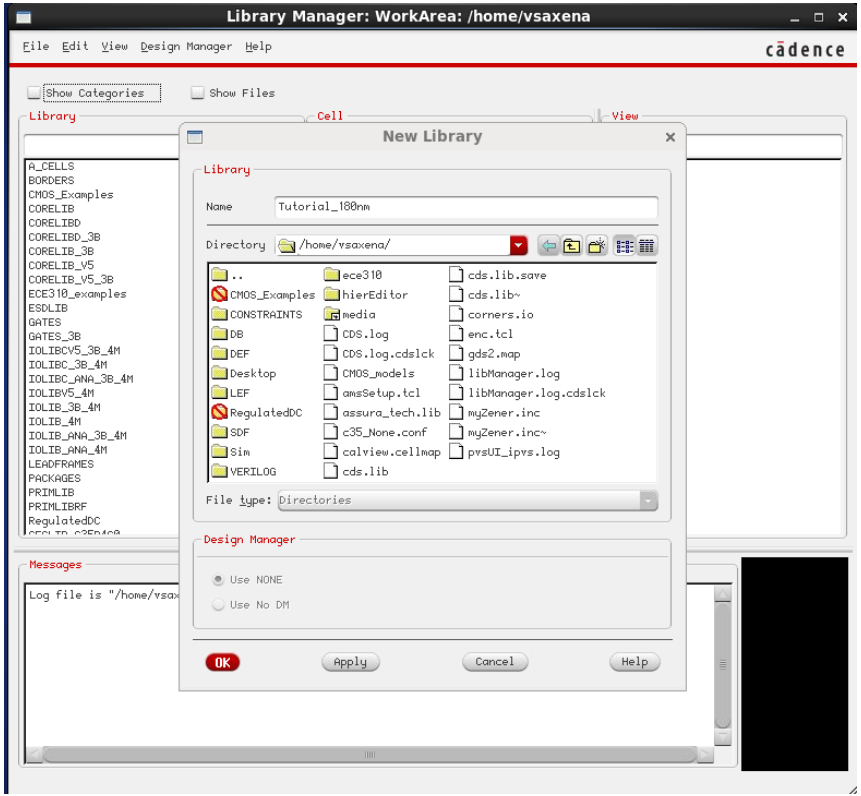
I_D VS V_{GS} (0.18 UM PROCESS)

- Launch Cadence Virtuoso
  - cadsetup ams035
  - virtuoso
- Click on library Manager



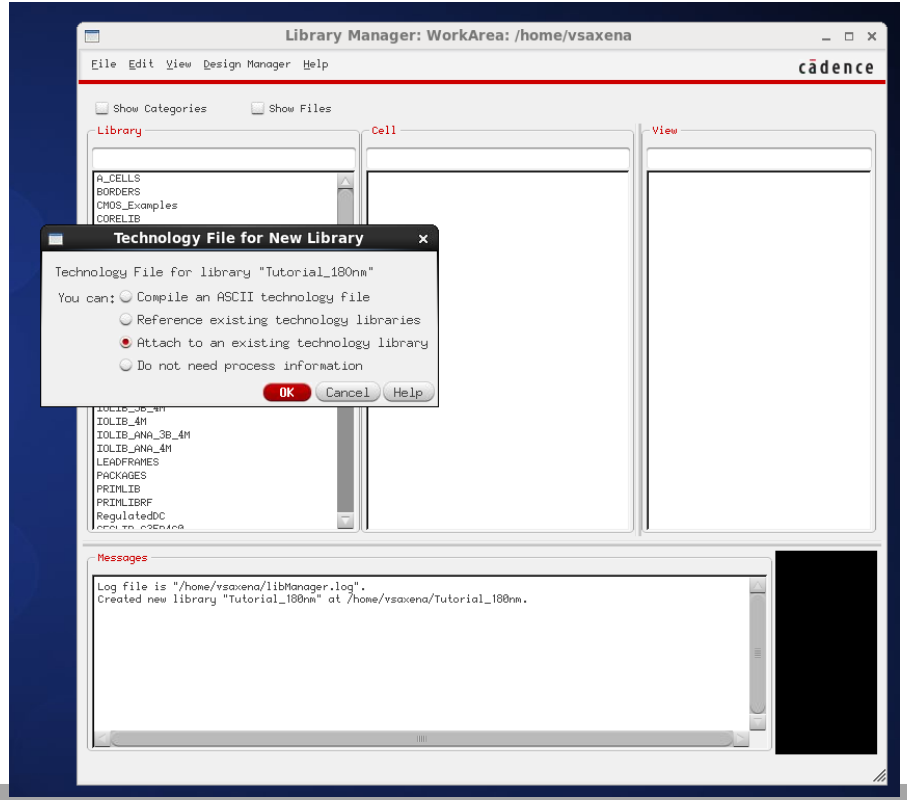
I_D VS V_{GS} (0.18 UM PROCESS)

- Create a new library, say Tutorial_180nm



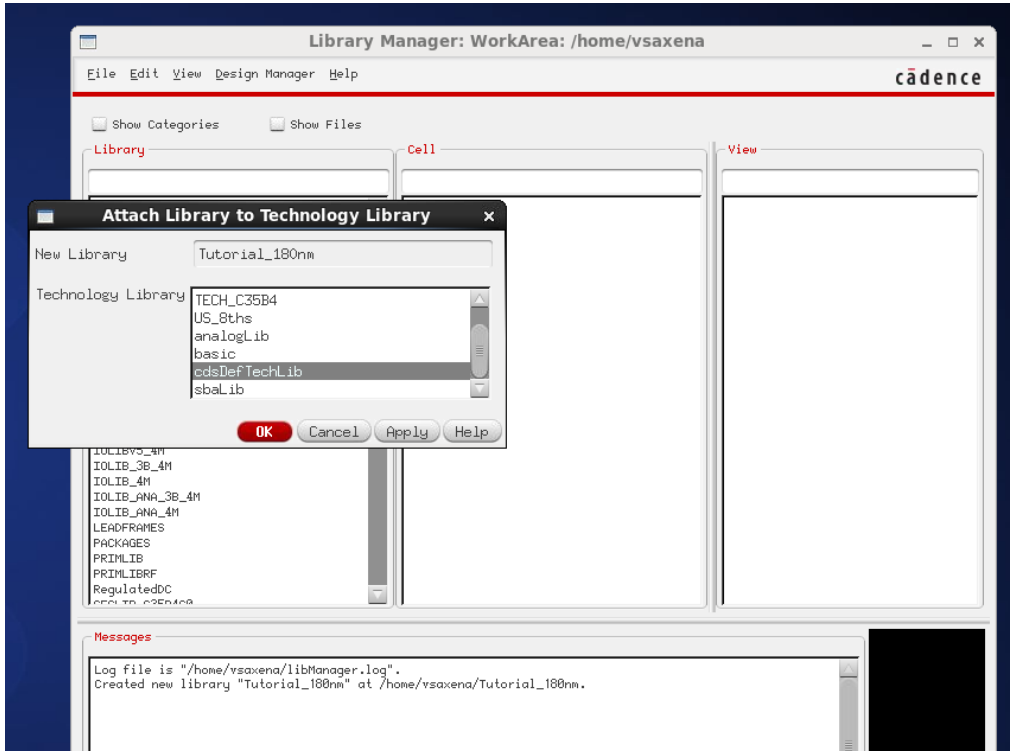
I_D VS V_{GS} (0.18 UM PROCESS)

- Attach it to an existing technology library



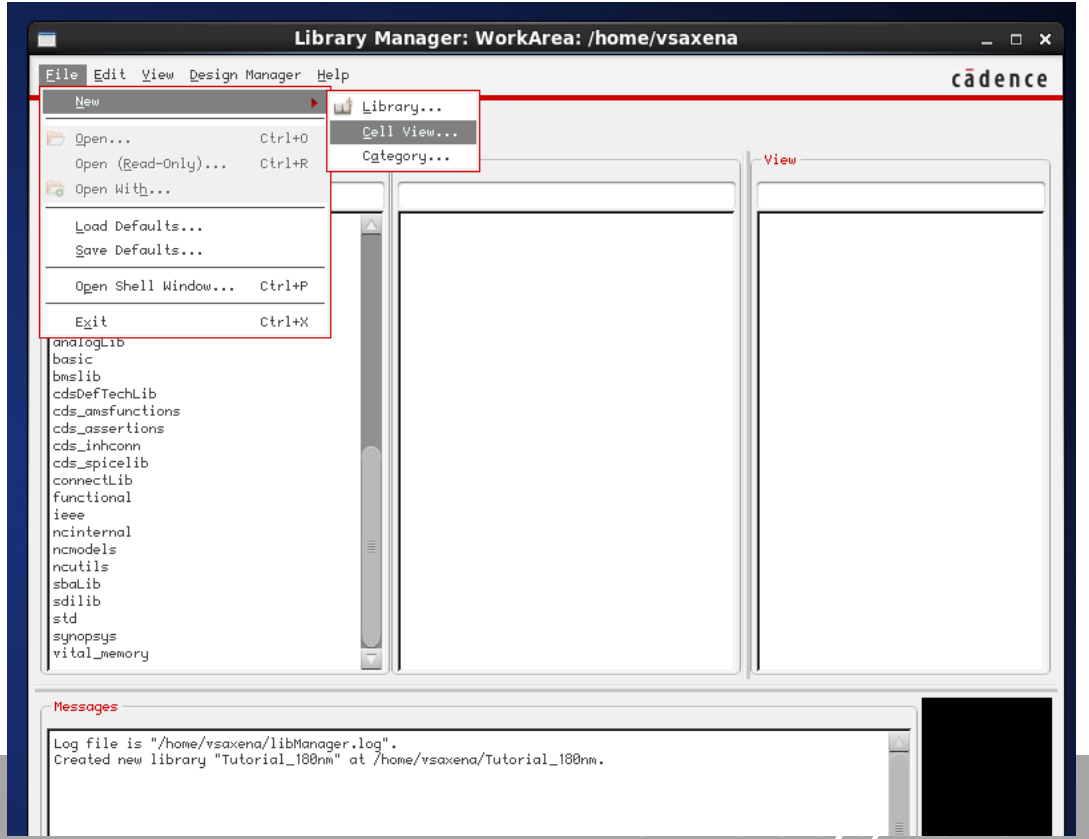
I_D VS V_{GS} (0.18 UM PROCESS)

- In our case it is: “cdsDefTechLib”



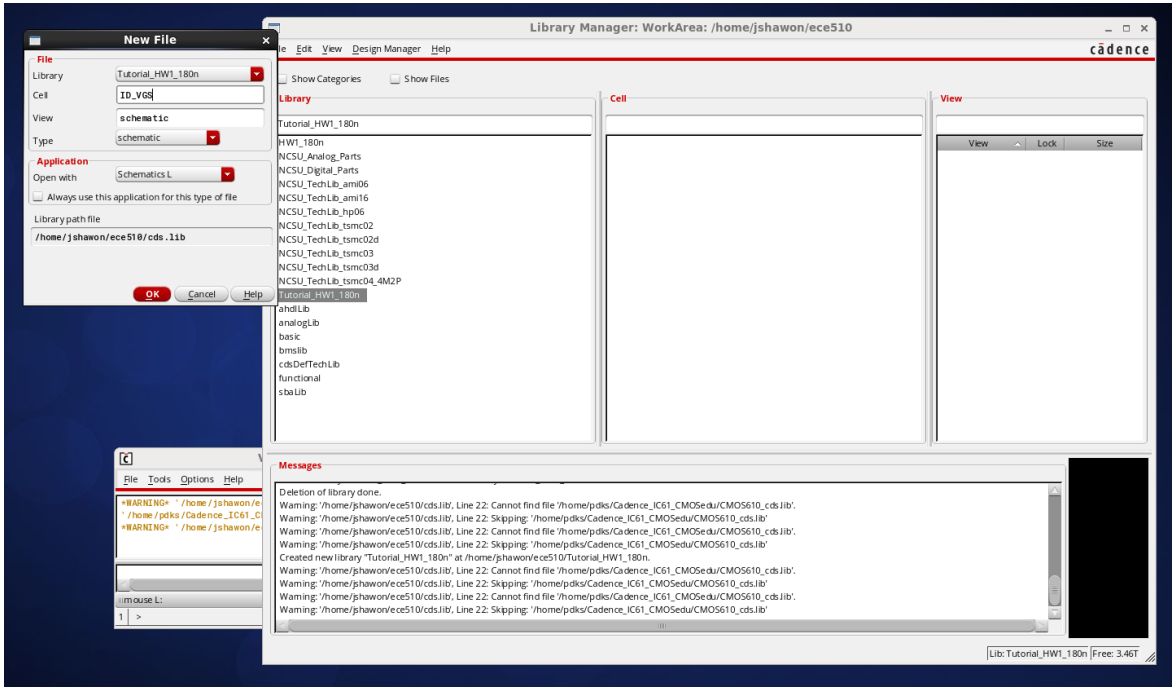
I_D VS V_{GS} (0.18 UM PROCESS)

- Create a cell view



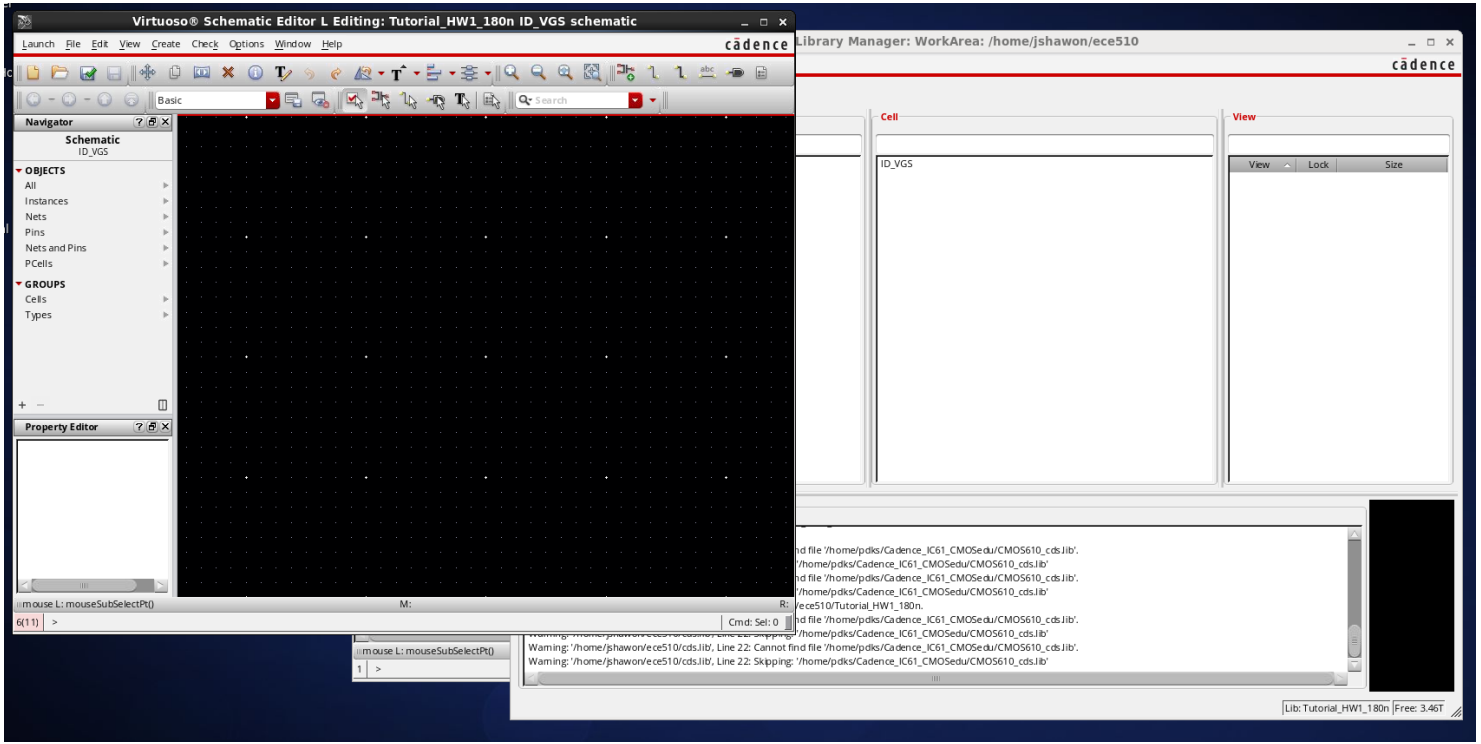
I_D VS V_{GS} (0.18 UM PROCESS)

- Give it an appropriate name. Click OK.



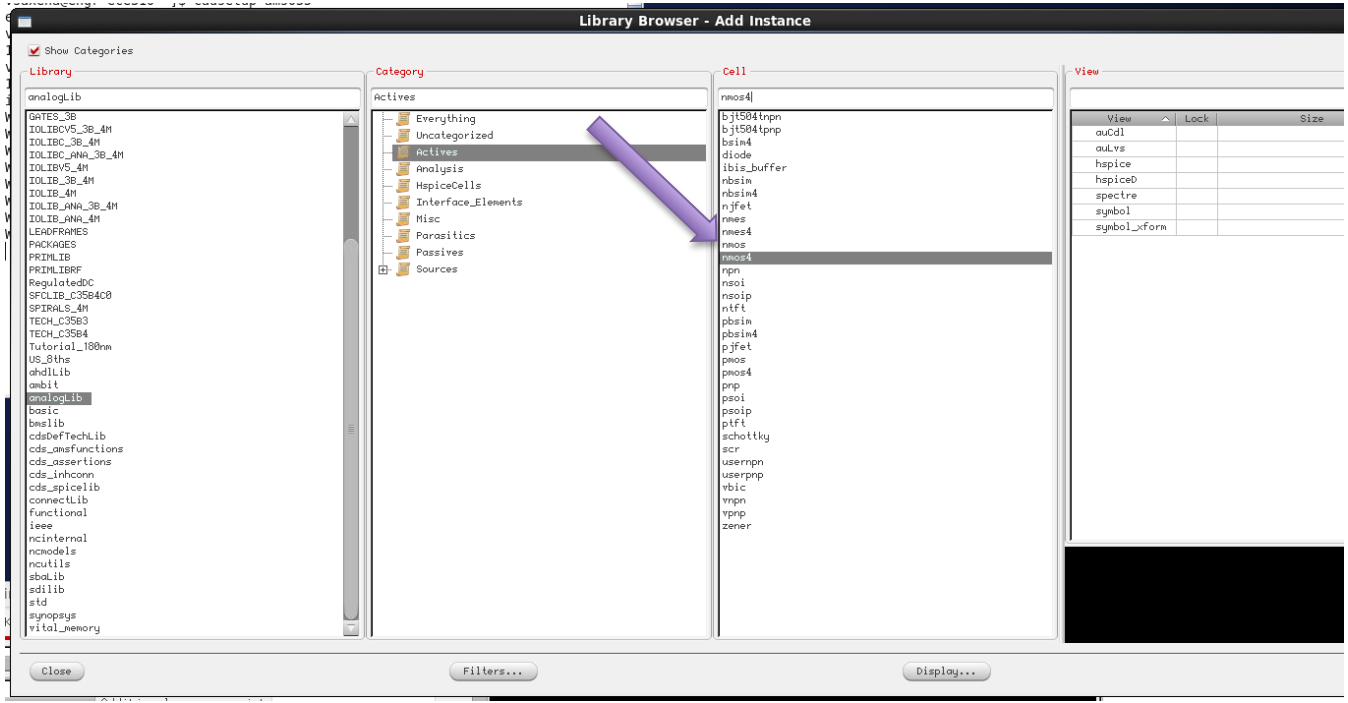
I_D VS V_{GS} (0.18 UM PROCESS)

- The schematic window will pop up.



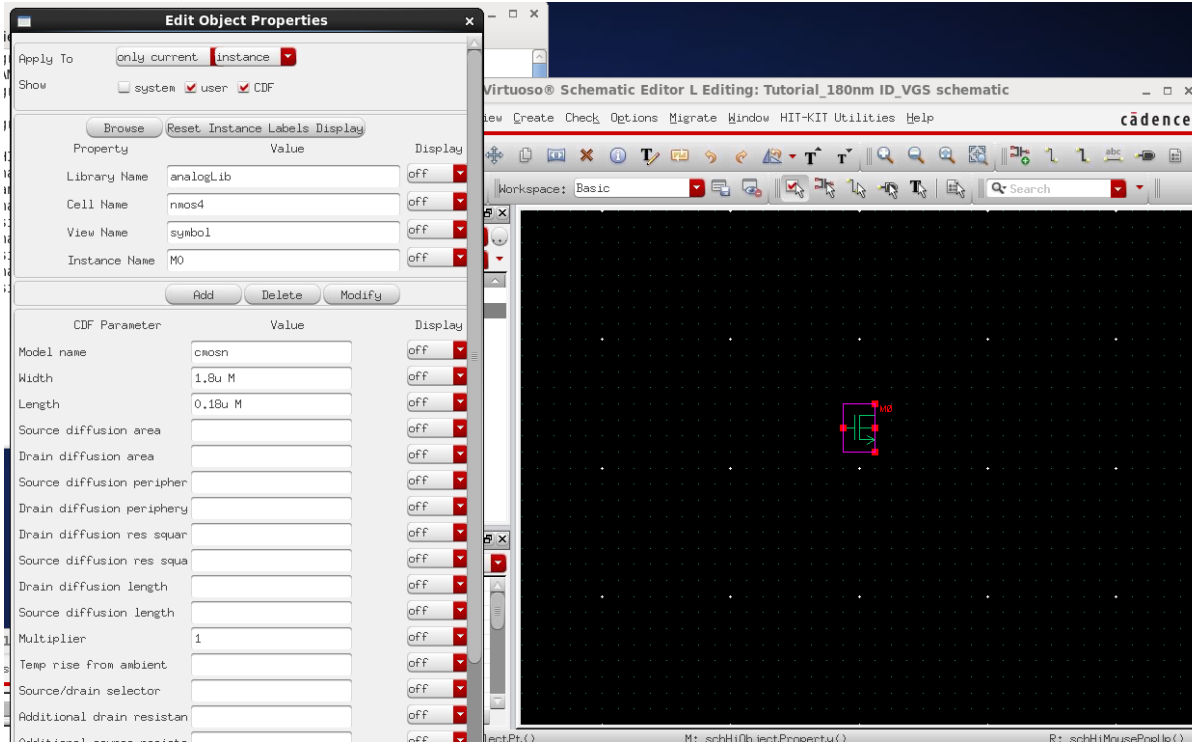
I_D VS V_{GS} (0.18 UM PROCESS)

- Press “I” or click on ‘add instance’ button to add circuit components to the schematic.



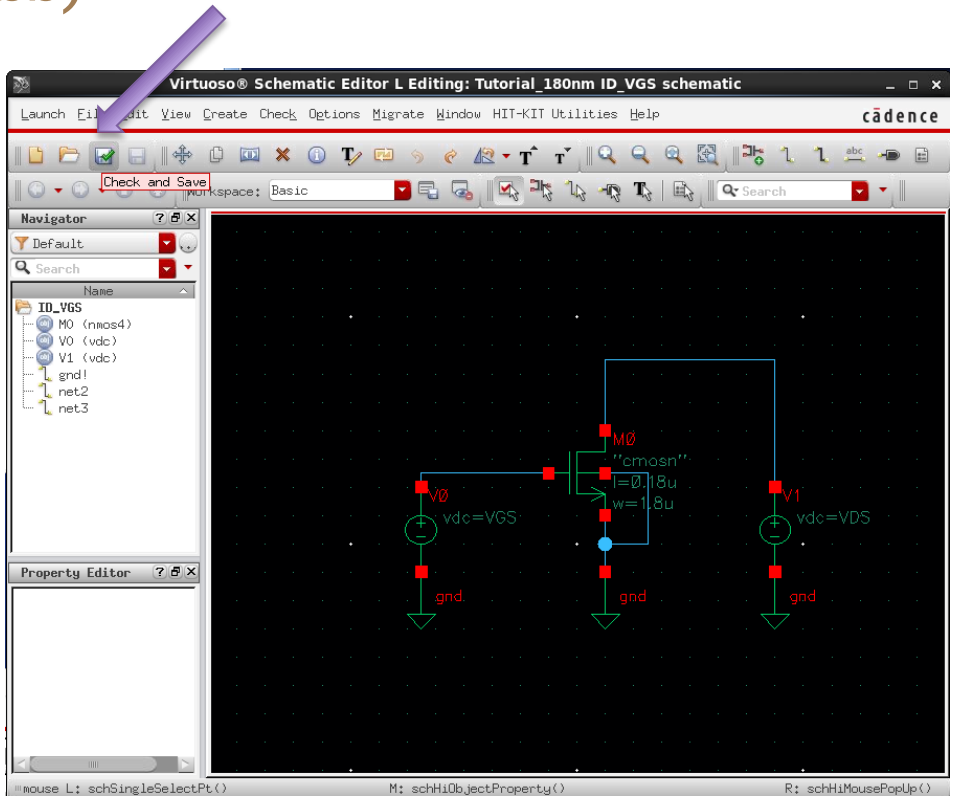
I_D VS V_{GS} (0.18 UM PROCESS)

- From analoglib, select the MOSFET & press “Q” to edit its properties.
- Enter the parameters as shown in the screenshot.
- Don’t forget to put the model name “cmosn” for NMOS and “cmosp” for PMOS.
- Also, always use absolute size of the MOSFET (0.18u NOT 0.18)



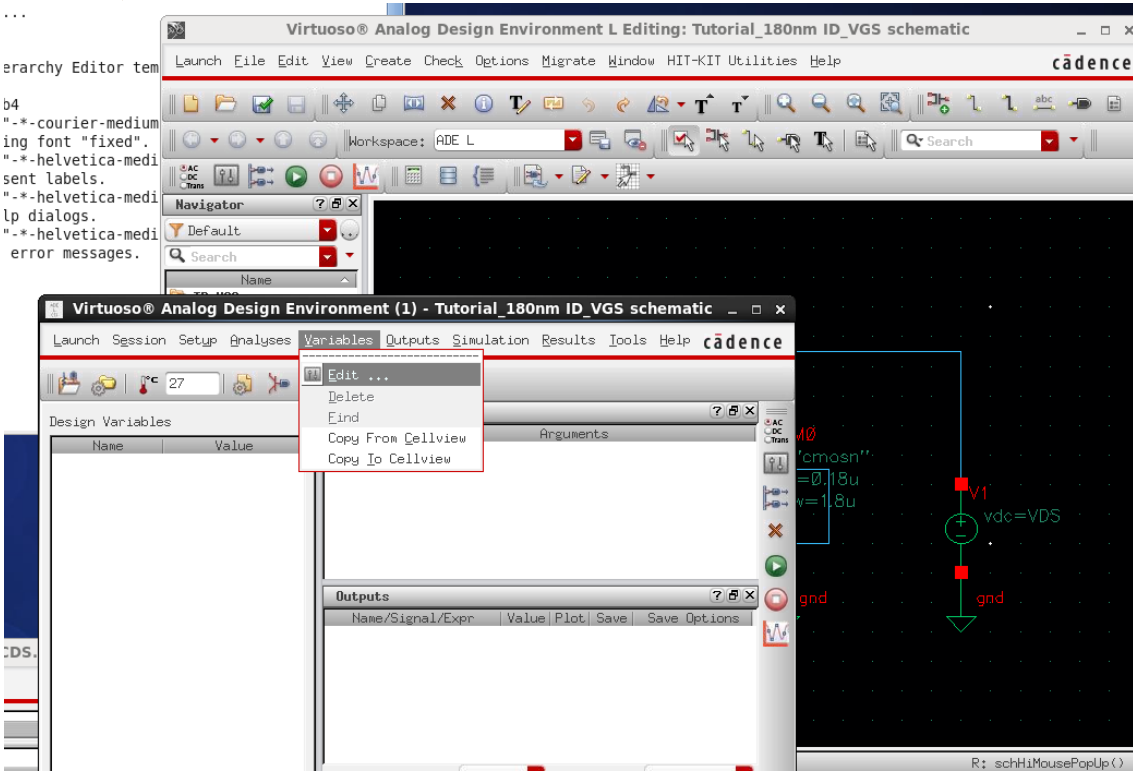
I_D VS V_{GS} (0.18 UM PROCESS)

- Complete the schematic
- Click on the “check and Save” Button to check if there is any error present in this schematic.
- Debug and fix any errors in the schematic.



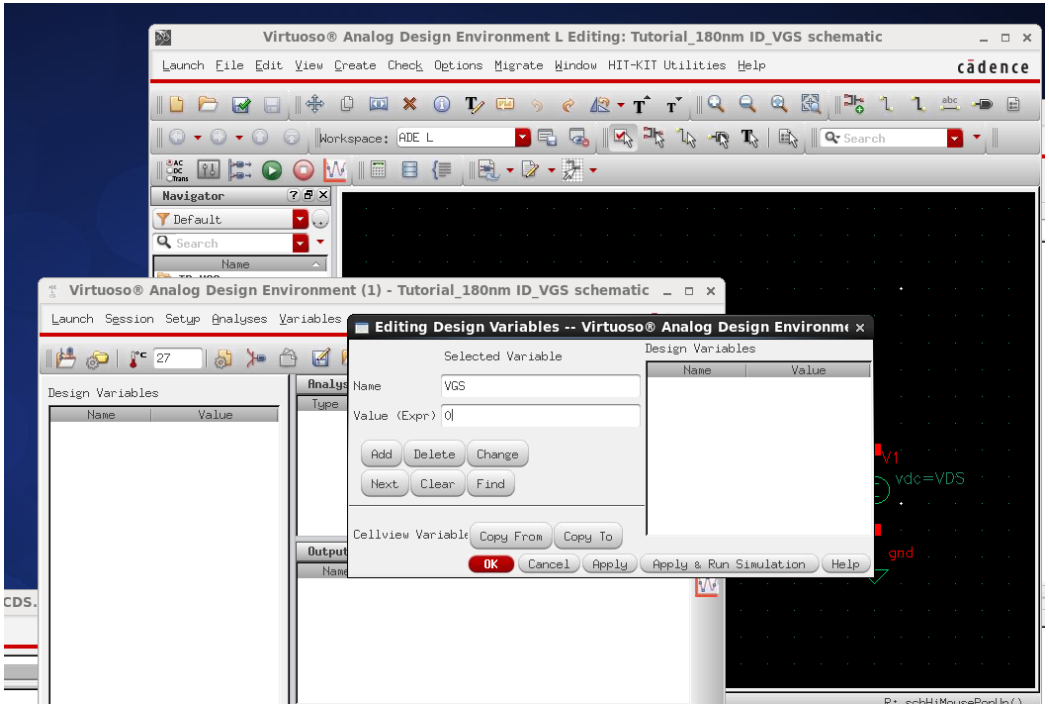
I_D VS V_{GS} (0.18 UM PROCESS)

- Launch ADE L to simulate the circuit.
- Add variables for simulation.

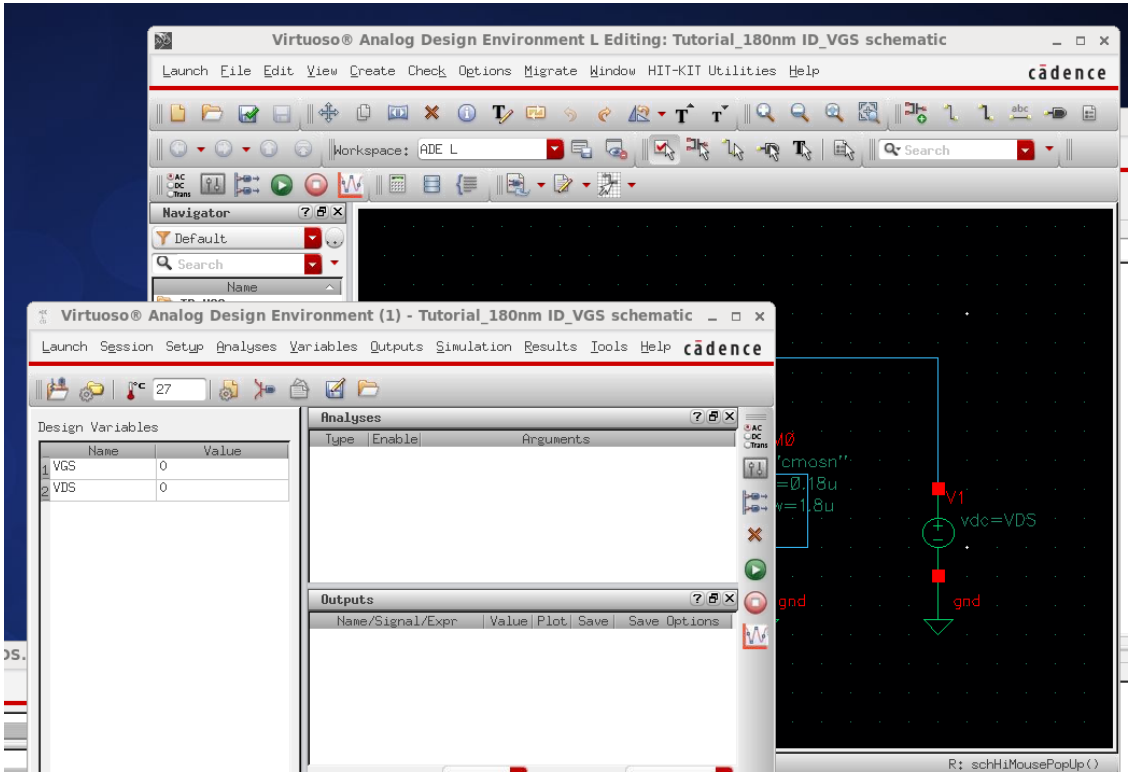


I_D VS V_{GS} (0.18 UM PROCESS)

- Click “add” and “OK” (both VDS & VGS; select appropriate values for them)

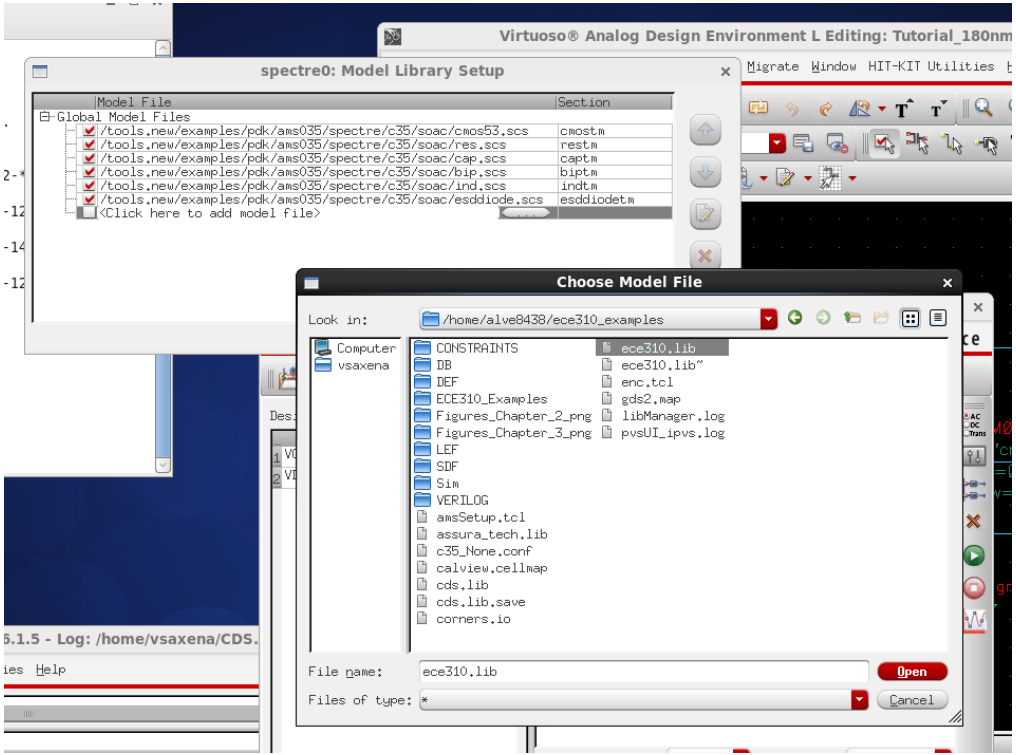


I_D VS V_{GS} (0.18 UM PROCESS)



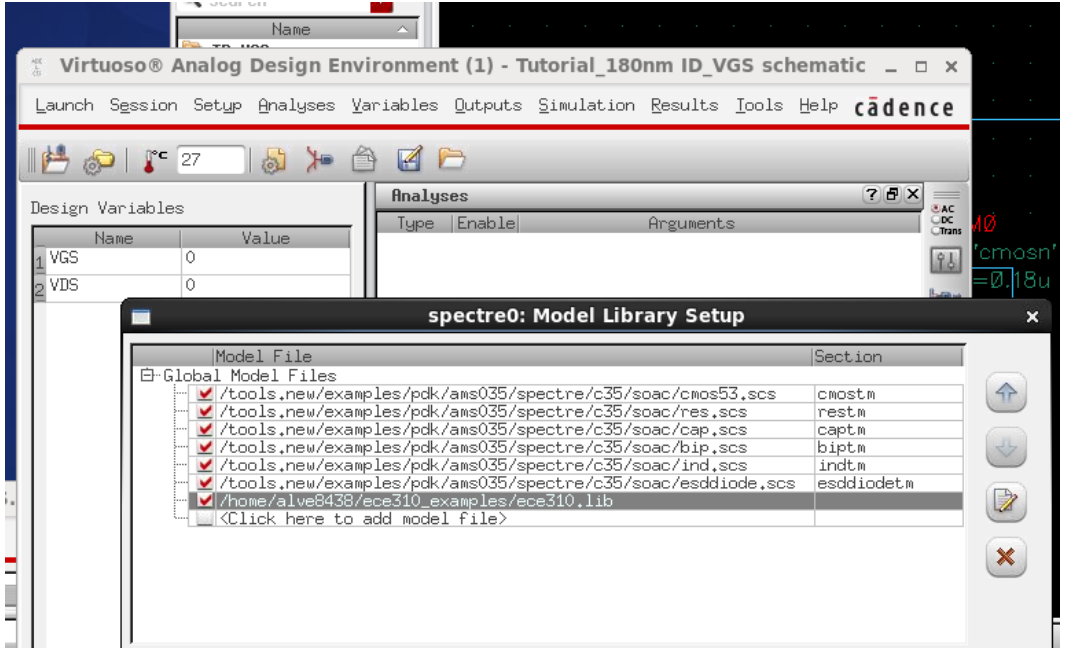
I_D VS V_{GS} (0.18 UM PROCESS)

- Now, we have to link the model parameters to our device. Therefore, click: Setup->Model Libraries
- Browse for the model file and add to the list



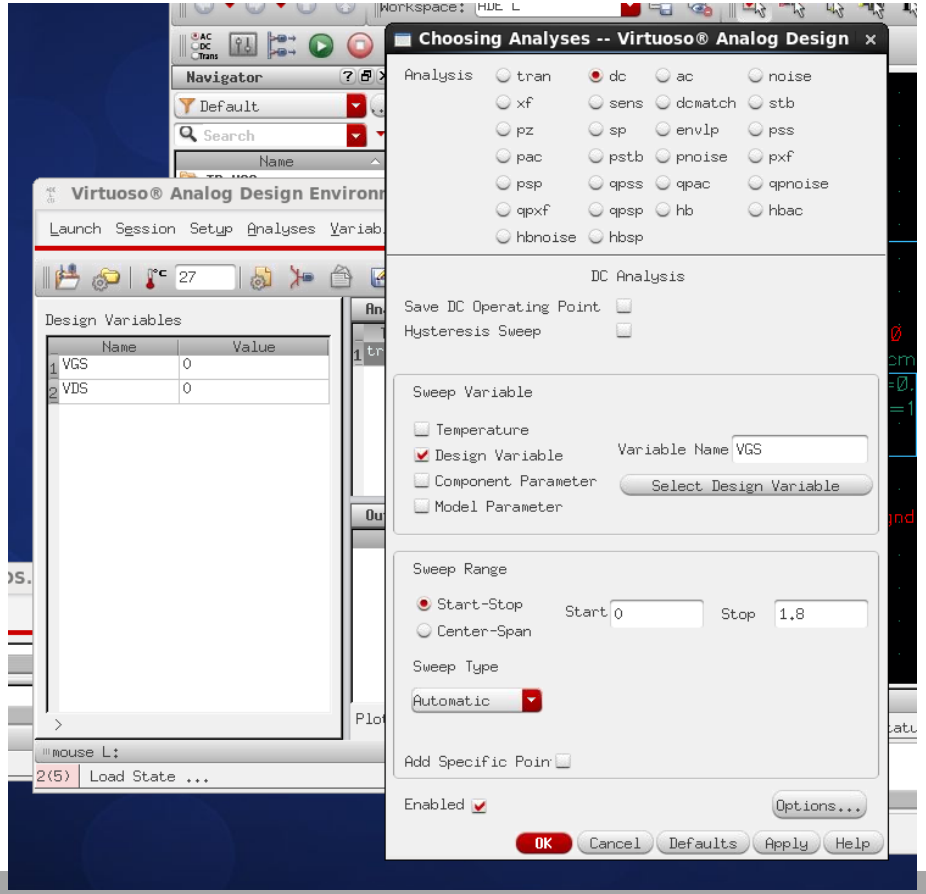
I_D VS V_{GS} (0.18 UM PROCESS)

- For ECE310, models are located at: /home/alve8438/ece310_examples/ece310.lib



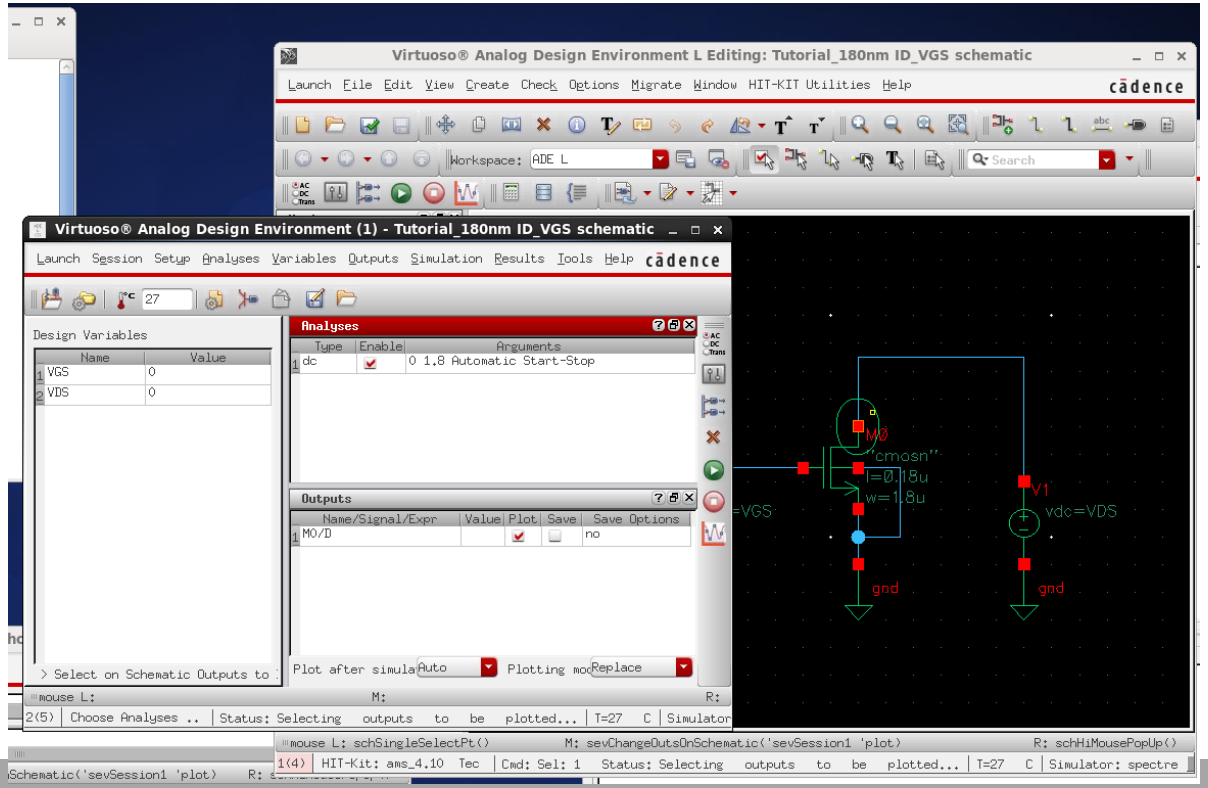
I_D VS V_{GS} (0.18 UM PROCESS)

- Setup DC analysis to sweep the required voltages



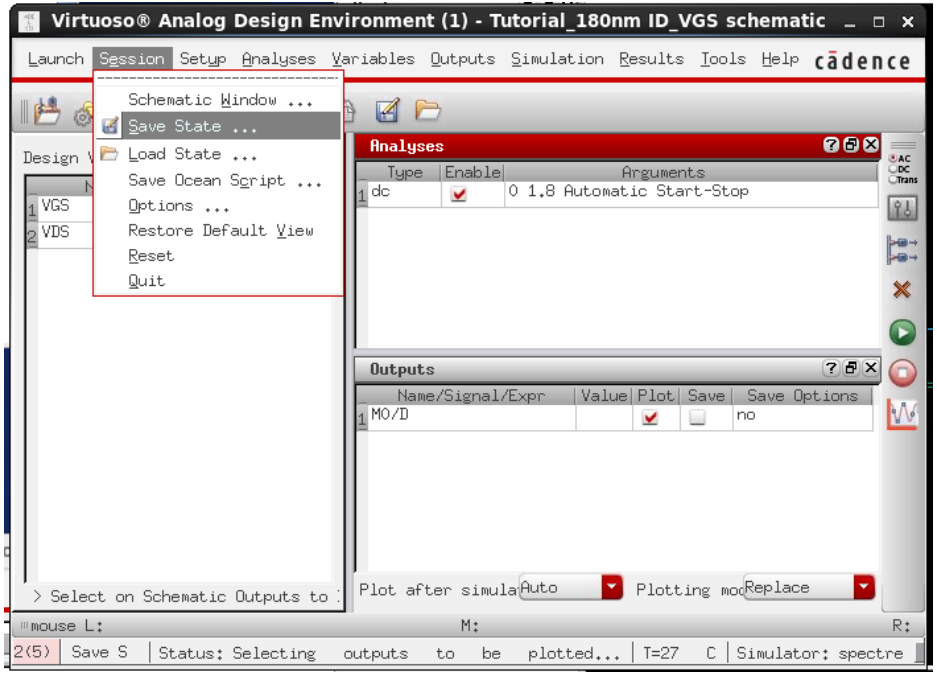
I_D VS V_{GS} (0.18 UM PROCESS)

- Select the outputs to be plotted from the schematic
- Outputs->To be Plotted->Select On Schematic



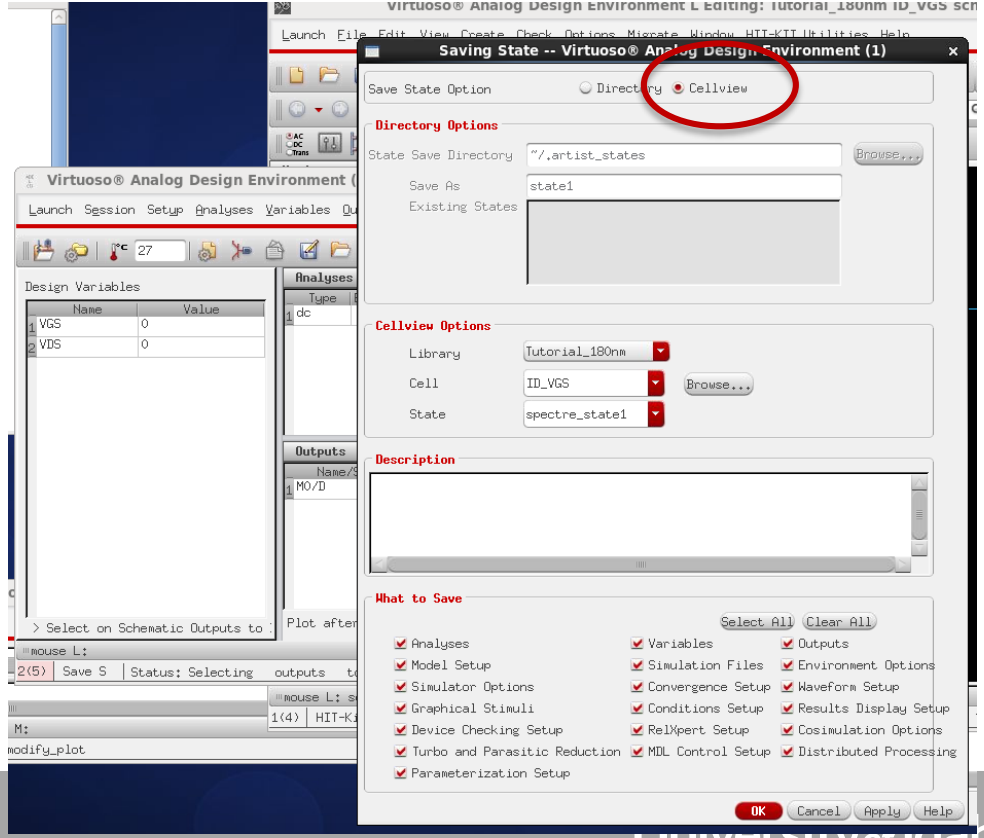
I_D VS V_{GS} (0.18 UM PROCESS)

- Save the state



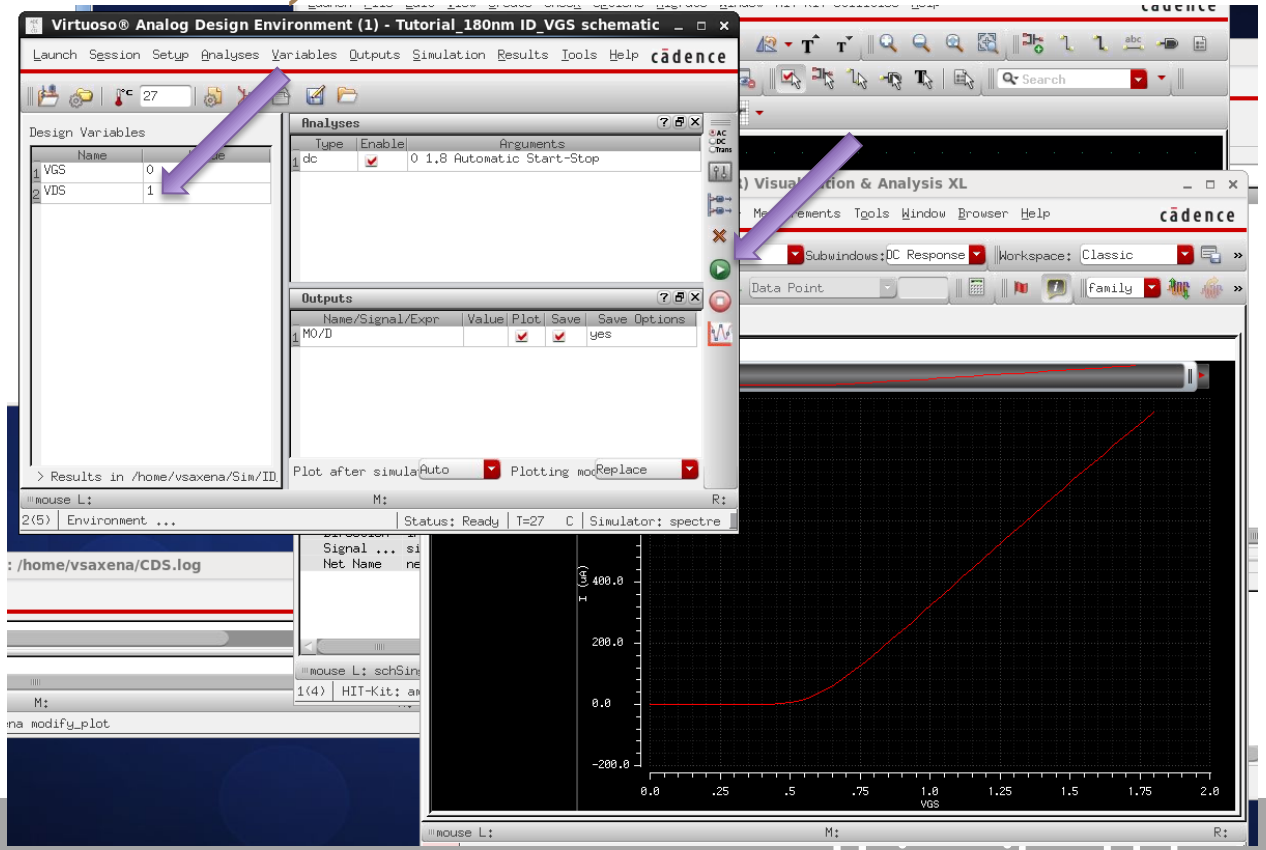
I_D VS V_{GS} (0.18 UM PROCESS)

- Always save the state in the Cellview



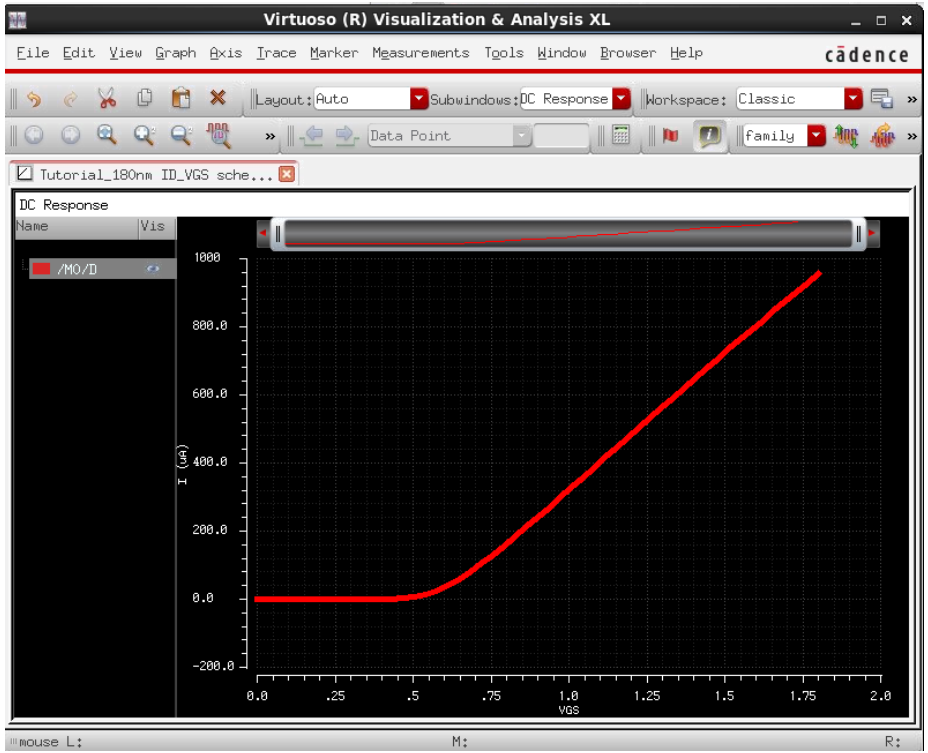
I_D VS V_{GS} (0.18 UM PROCESS)

- Now, for this particular analysis, we have to select a value for VDS. Here, we have set it as 1V.
- Click “Netlist and Run”



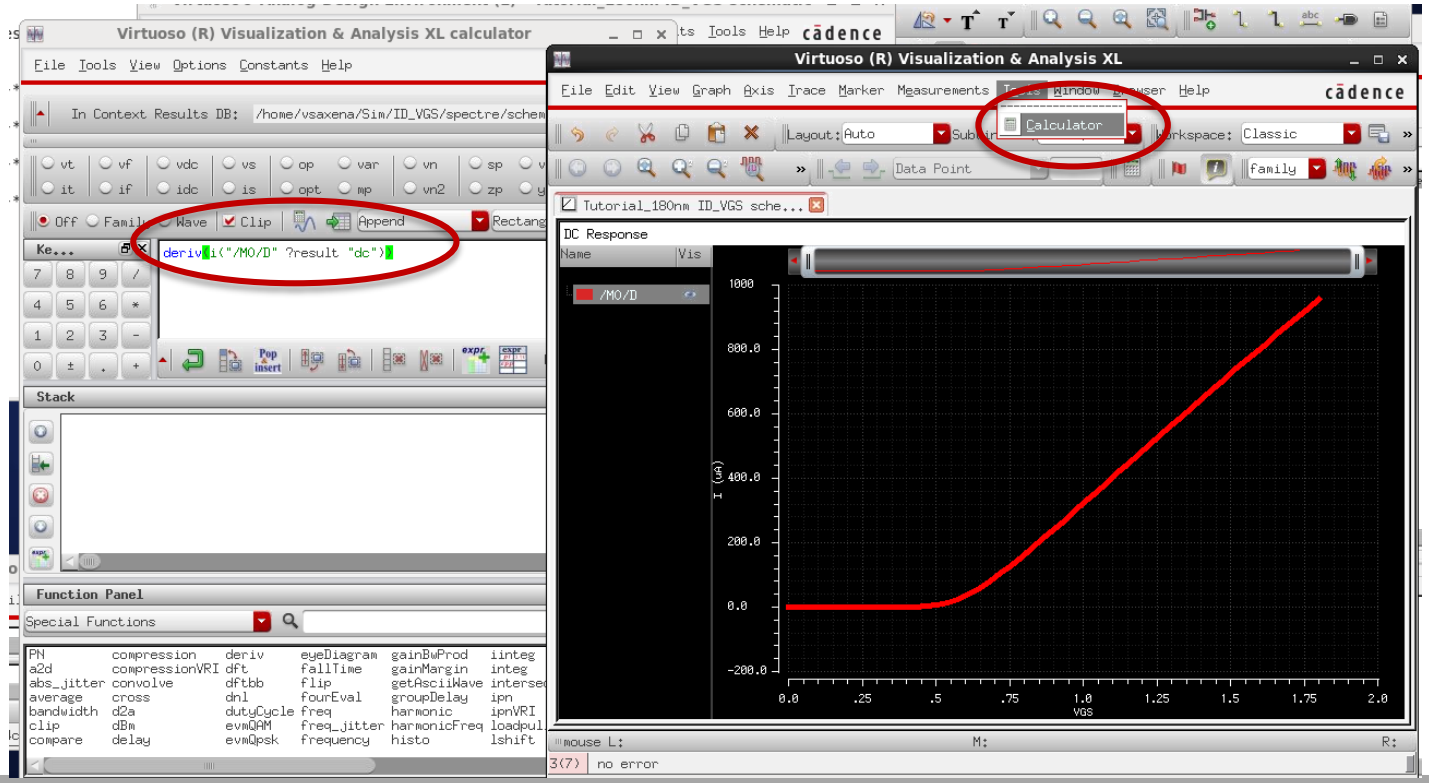
I_D VS V_{GS} (0.18 UM PROCESS)

- I_D vs V_{GS} Plot

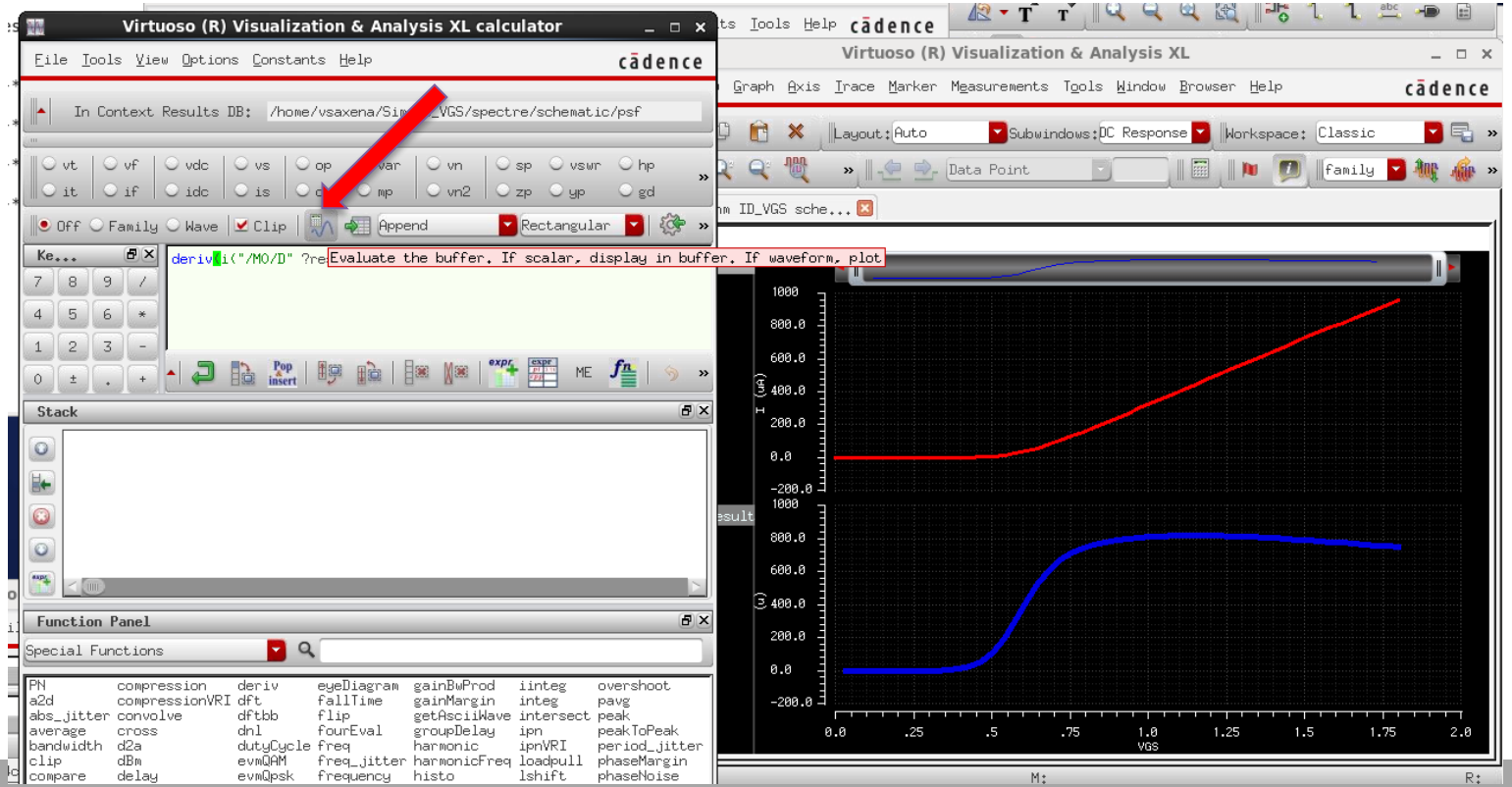


PLOTTING GM

- To plot g_m, use calculator from Tools menu
- deriv() operator provides the derivative



PLOTTING GM



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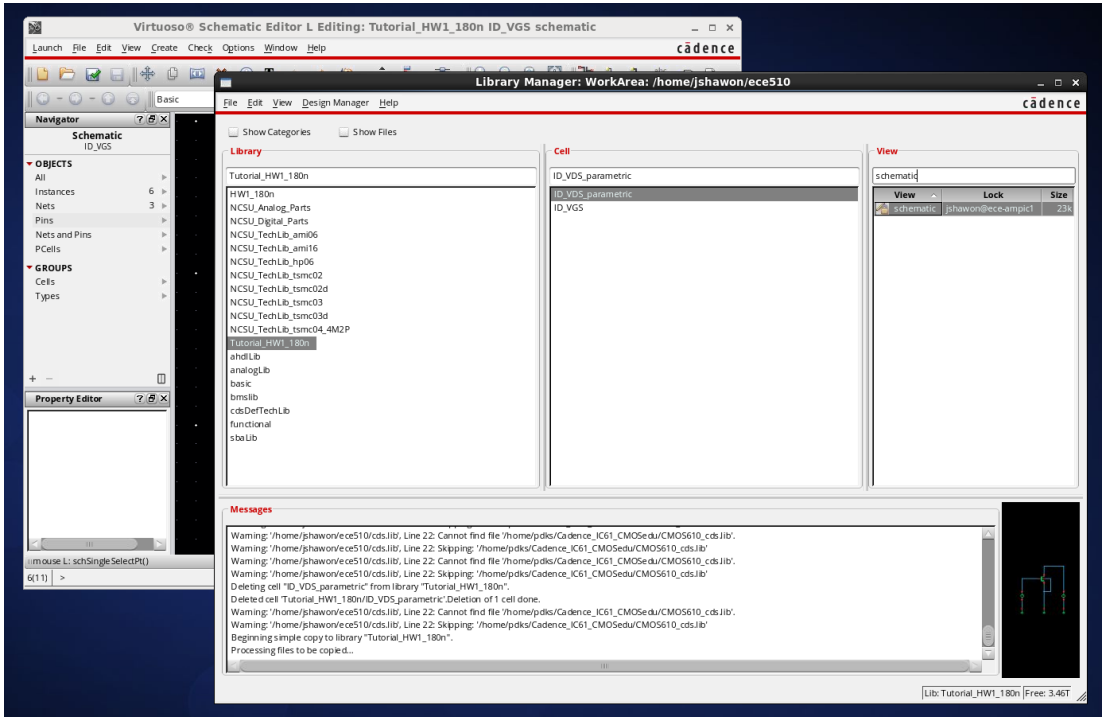
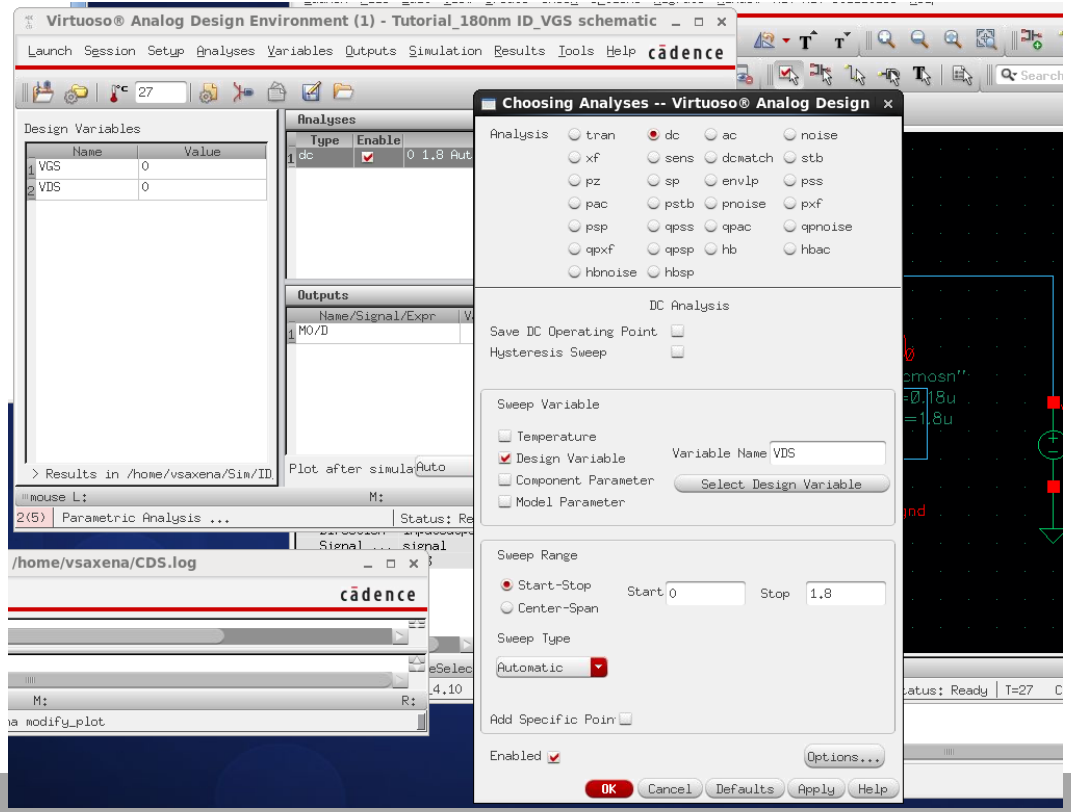
I_D VS V_{DS} FOR DIFFERENT V_{GS}(0.18 UM PROCESS)

- Like before, you may create another cellview for ID-VDS sweep or just use the previous one



I_D VS V_{DS} FOR DIFFERENT V_{GS}(0.18 UM PROCESS)

- Create a DC sweep analysis for VDS
- This will provide one ID-VDS plot
- But we need a family of curves for varying VGS



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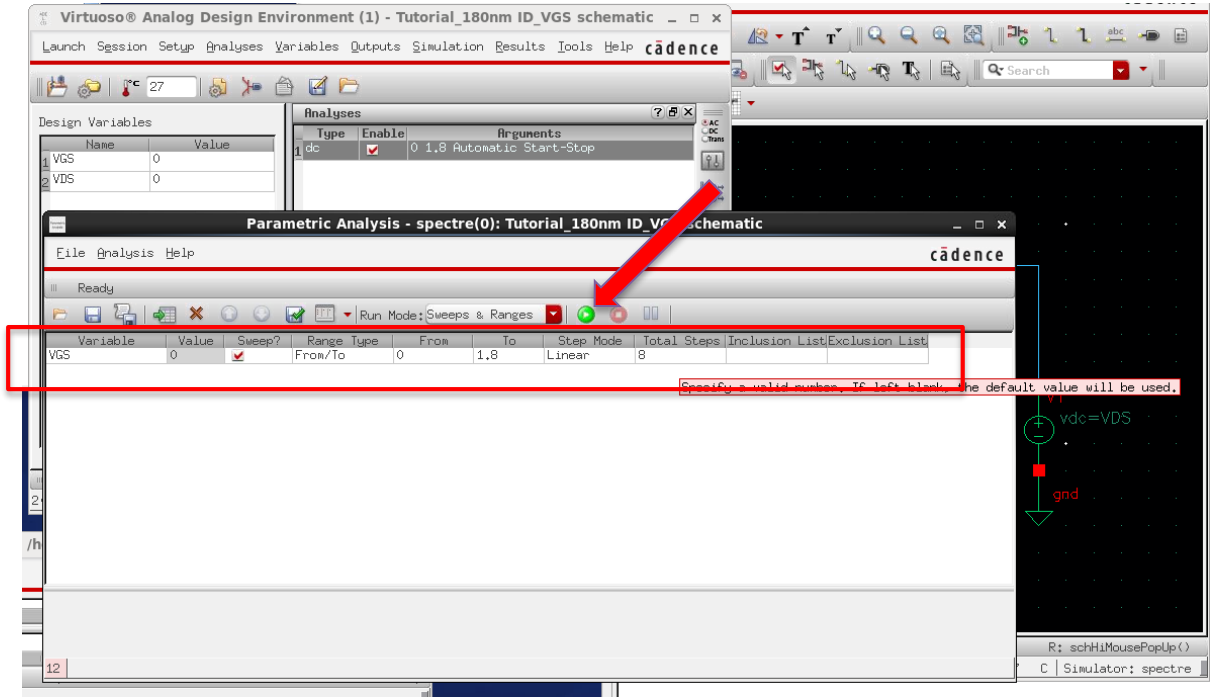
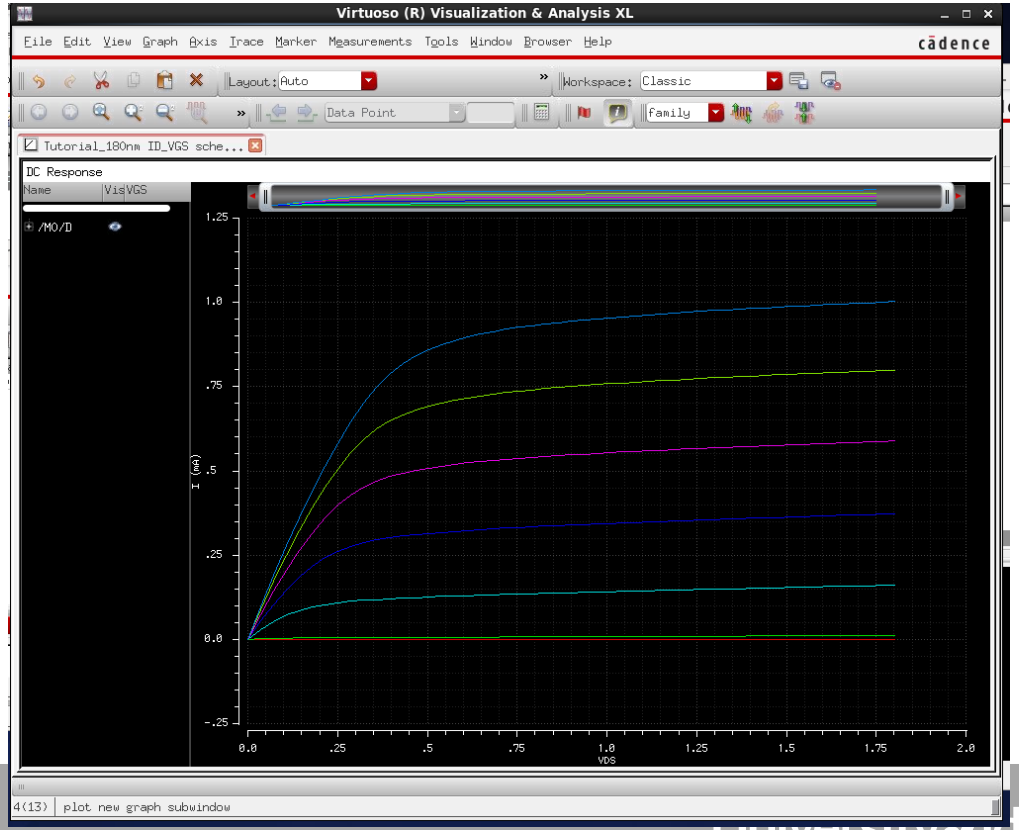
I_D VS V_{DS} FOR DIFFERENT V_{GS}(0.18 UM PROCESS)

- For parametric analysis, click:
  Tools> Parametric Analysis
- Setup the parametric analysis to double sweep VGS along with VDS
  - Think of it as two nested for loops in a code
- Click on the green button to run the analysis



I_D VS V_{DS} FOR DIFFERENT V_{GS}(0.18 UM PROCESS)



PMOS SIMULATIONS

- Now, figure out how to obtain ID-VSG and ID-VSD plots for the PMOSFETs
- Note that the body of the PMOS should be tied to VDD