Prelab 1, Analog Integrated Curcuits

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f) Task: Determine the transconductance g\_m of the transistor at VGS = 0.5 VDiagram

Description automatically generated with low confidence

Simulation of DC-Sweep of G\_gs,dc from 0V to 1V

Plot of I\_d,dc and the slope g\_m= I\_d,dc/V\_gs,dc at G\_gs,dc=0,5V by D(I(IM1)

Graphical user interface

Description automatically generated

g\_m= 124,6µS @ V\_gs,dc=0,5V

g) Task: Determine the transistor V\_th value by sketching the tangent line at the highest slope of I\_d,dc/V\_gs,dc and determin the voltage of U\_gs,dc at I\_d,dc=0A of the tangent

Graphical user interface, chart

Description automatically generated

Simulation of DC-Sweep of G\_gs,dc from 0V to 2V

The highest slope was determined at V\_gs,dc=1,38V with g\_m=204,1µS

A linear straight was applied as Tangent to I\_dc,dc (Cursor Y1) with the parameter   
204u \* V\_VGDC - 103u which crossed I\_d,dc = 0A at U\_gs,dc = U\_th = 505mV (Cursor Y2)

Graphical user interface

Description automatically generated

i) Task: Determine the linear (triode) region of the transistor

To satisfy linear region

* V\_gs,dc < V\_th = 505mV 🡪 always fulfilled because V\_gs,dc = 500mV < 505mV  
  auch komisch, oder? Hätte gedacht, das V\_gs über V\_th liegen sollte und bei ausreichendem V\_ds,dc in saturation kommt
* and V\_ds,dc < V\_gs,dc – V\_th = 500mV – 505mV = -5mV (Sim zeigt das bis ~164mV ende von V\_ds,dc linearer Bereich :/ Ist V\_th oder Formel falsch?)

Simulation of DC-Sweep of G\_ds,dc from 0V to 2V  
Plot of I\_d,dc

A screenshot of a computer

Description automatically generated with medium confidence j) Task: Determin small signal output resistance r\_ds = r\_o. Determine slope r\_o = I\_d,dc/D\_ds,dc

* r\_ds = 196 µS @ V\_ds,dc = 0V
* r\_ds = 118 µS @ V\_ds,dc = 50mV
* r\_ds = 1,9 µS @ V\_ds,dc = 0,9V

Simulation of DC-Sweep of G\_ds,dc from 0V to 2V  
Plot of I\_d,dc and Derivation D(ID(M1))

Graphical user interface

Description automatically generated