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

**EE105 Lab Experiments**

# Report 1: Introduction to SPICE

## Solutions

Attach your netlists and plots in the order you created them for the lab. For 3.1, only include one netlist for one transient analysis step time. **Remember to print with a white background.**

3.1.4 What is the value measured from the graph? How does the value from the graph compare to the value you'd expect from the RC time constant?

Measuring from the graph gives $t_{rise} = 0.101$ ms. The RC time constant is $RC = 10^3 \times 10^{-7} = 0.1$ ms, which is within 1 % of the measured value.

3.1.5 What is the value measured with the `.measure` statement? How does the result of the `.measure` statement compare to the result from the graph?

The `.measure` statement gives $t_{rise} = 0.10041$ ms. This is also very close to the result of the graphical measurement and even closer to the expected RC time constant than the graphical result.

3.1.6 What effect does changing the step time have on the result of the `.measure` statement?

Smaller step times result in more accurate measurements, as one would expect.

3.3.2 What is the voltage gain?

$A_v = -1.9449$

```
EE105 Experiment 1: 3.1 Transient Analysis

vs vs gnd ac PULSE(0V 5V 0s 0s 0s 1ms 2ms)
r1 vs vo  1k
c1 vo gnd 0.1u

.tran 0.001ms 10ms
.measure tran trise when v(vo)=3.16V
.option post=2
.end
```

```
EE105 Experiment 1: 3.2 DC Analysis

.model nmos nmos (kp=60e-6 vto=1 lambda=0.05)
m1  d g gnd gnd nmos W=4.5u L=1.5u
vgs g gnd 1V
vdd d gnd 1V

.dc vdd 0V 5V 0.1V vgs 0V 5V 1V
.option post=2
.end
```

```
EE105 Experiment 1: 3.3 TF Analysis

vs  vs gnd 1V
rb  vs vb  1k
rpi vb ve  400
g1  vo ve  vb ve 38m
ro  vo ve  24k
rc  vo gnd 10k
re  ve gnd 5k

.tf v(vo) vs
.end
```

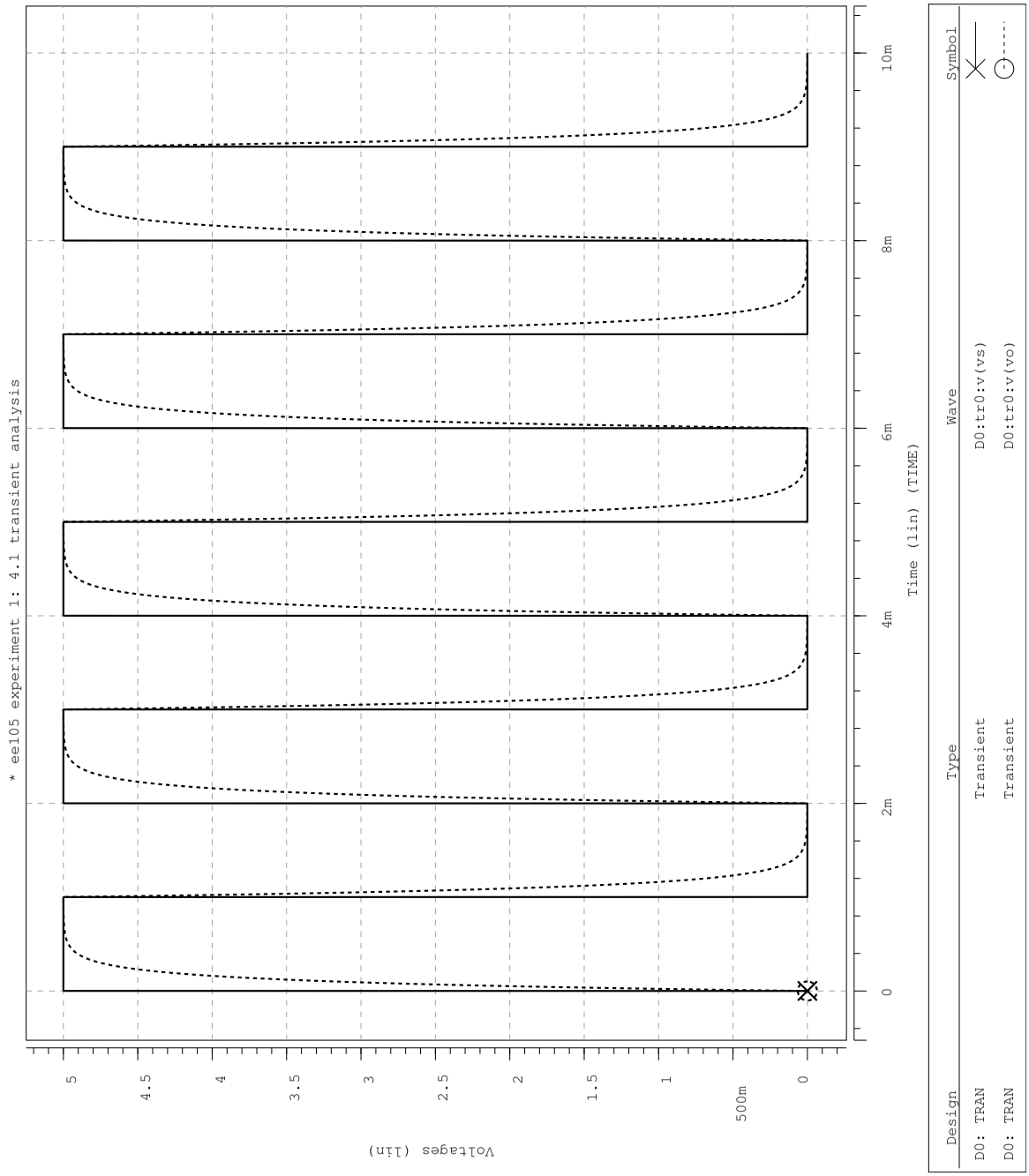


Figure 1: Plot of the transient response of an RC circuit (input and output)

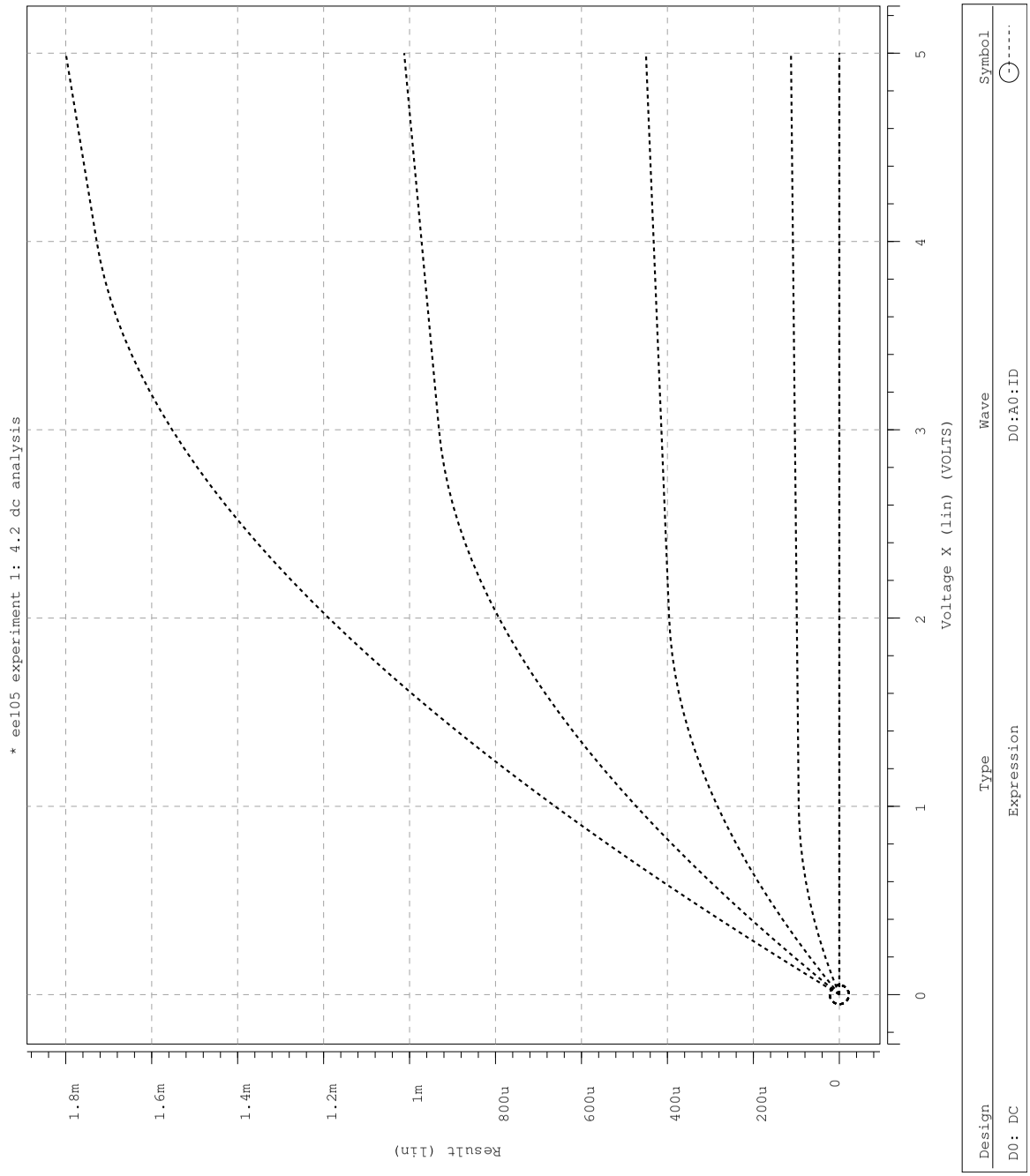


Figure 2: IV curve of an NMOS transistor