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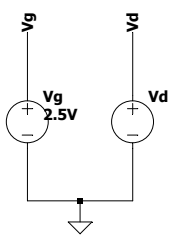
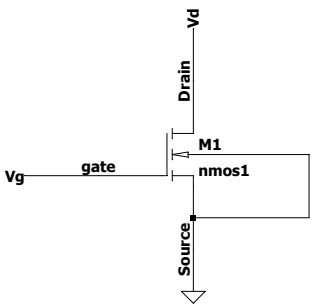
Analog_VLSI LAB_1
Task: 1 small signal analysis - Vgs constant Vds varing






```
.model nmos1 nmos [vto=0.7V L=2um W=10um lambda=0.03 kp=50u gamma=0.0]

.meas Id FIND Id(M1) WHEN V(Drain)=4V
.meas ro FIND 1/d(Id(M1)) WHEN V(Drain)=4V
.meas Ron_0.2 FIND 1/d(Id(M1)) WHEN V(Drain)=0.2V

.dc Vd 0 5 0.1
```

By Calculation

for lambda = 0
---
id: id(m1)= 405u at 4
ro: 1/d(id(m1))=High at 4
ron_0.2: 1/d(id(m1))=2500 at 0.2
ron_0.3: 1/d(id(m1))=2666 at 0.3

for lambda = 0.04
---
id: id(m1)=469.8u at 4
ro: 1/d(id(m1))=61.728k at 4
ron_0.2: 1/d(id(m1))=2500 at 0.2
ron_0.3: 1/d(id(m1))=2666 at 0.3

for lambda = 0.05
---
id: id(m1)=486u at 4
ro: 1/d(id(m1))=49.328k at 4
ron_0.2: 1/d(id(m1))=2500 at 0.2
ron_0.3: 1/d(id(m1))=2666 at 0.3

for lambda = 0.06
---
id: id(m1)=502.2u at 4
ro: 1/d(id(m1))=41.152k at 4
ron_0.2: 1/d(id(m1))=2500 at 0.2
ron_0.3: 1/d(id(m1))=2666 at 0.3

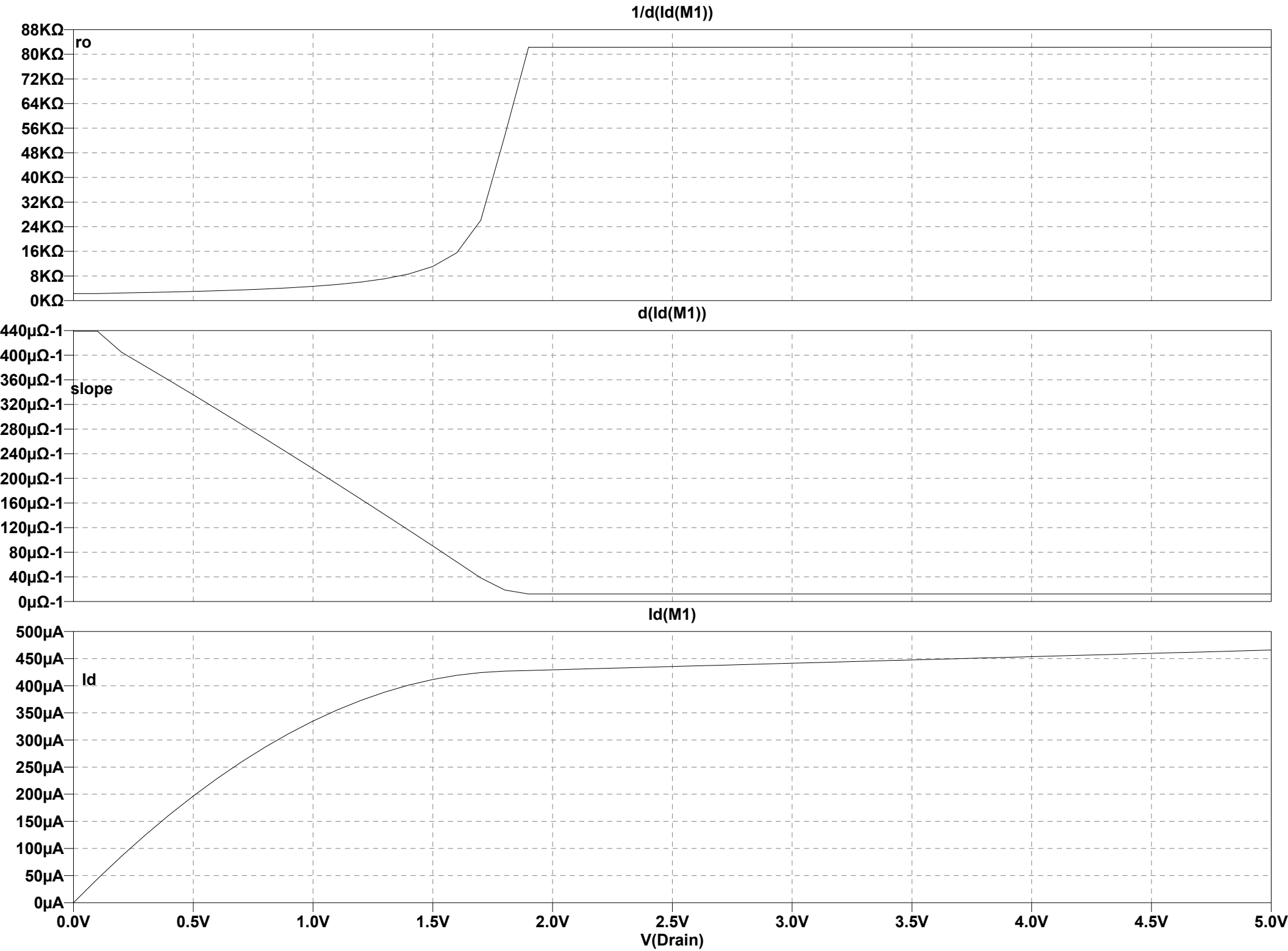
By Simulation

for lambda = 0
---
id: id(m1)=0.000405 at 4
ro: 1/d(id(m1))=1e+308 at 4
ron_0.2: 1/d(id(m1))=2424.24 at 0.2
ron_0.3: 1/d(id(m1))=2580.65 at 0.3

for lambda = 0.04
---
id: id(m1)=0.0004698 at 4
ro: 1/d(id(m1))=61728.7 at 4
ron_0.2: 1/d(id(m1))=2394.92 at 0.2
ron_0.3: 1/d(id(m1))=2528.13 at 0.3

for lambda = 0.05
---
id: id(m1)=0.000486 at 4
ro: 1/d(id(m1))=49382.7 at 4
ron_0.2: 1/d(id(m1))=2387.7 at 0.2
ron_0.3: 1/d(id(m1))=2515.33 at 0.3

for lambda = 0.06
---
id: id(m1)=0.0005022 at 4
ro: 1/d(id(m1))=41151.9 at 4
ron_0.2: 1/d(id(m1))=2380.53 at 0.2
ron_0.3: 1/d(id(m1))=2502.66 at 0.3


1/d(Id(M1))
88KΩ
80KΩ
72KΩ
64KΩ
56KΩ
48KΩ
40KΩ
32KΩ
24KΩ
16KΩ
8KΩ
0KΩ
ro
d(Id(M1))
440μΩ-1
400μΩ-1
360μΩ-1
320μΩ-1
280μΩ-1
240μΩ-1
200μΩ-1
160μΩ-1
120μΩ-1
80μΩ-1
40μΩ-1
0μΩ-1
slope
Id(M1)
500μA
450μA
400μA
350μA
300μA
250μA
200μA
150μA
100μA
50μA
0μA
Id
0.0V
0.5V
1.0V
1.5V
2.0V
2.5V
3.0V
3.5V
4.0V
4.5V
5.0V
V(Drain)