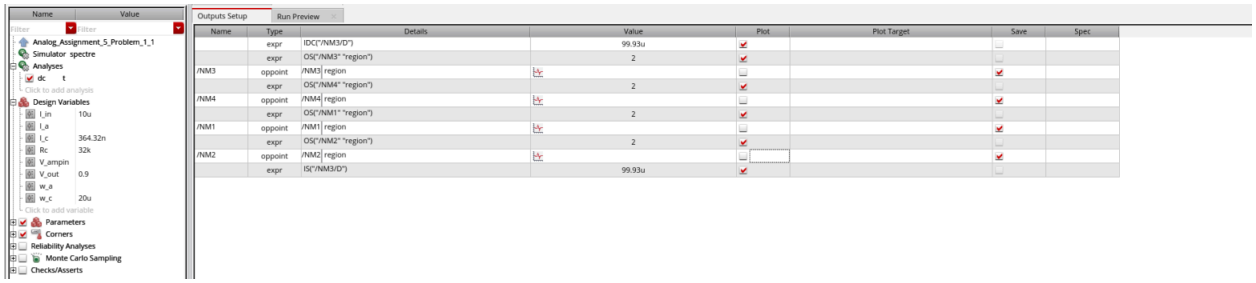
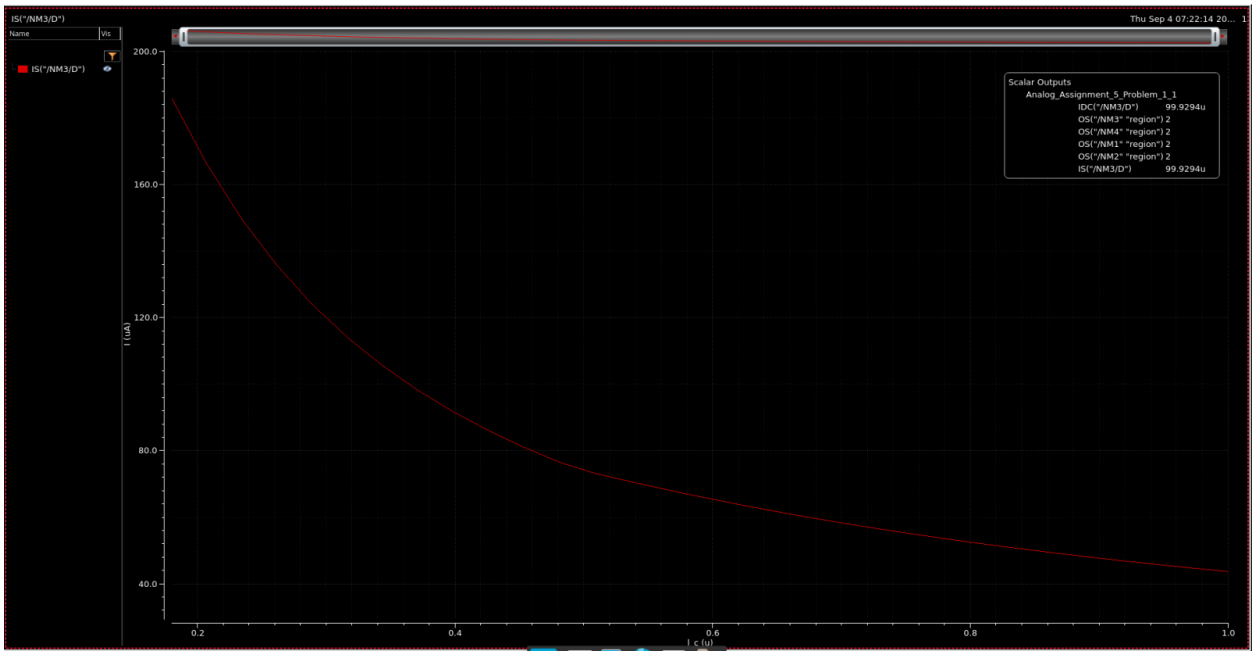
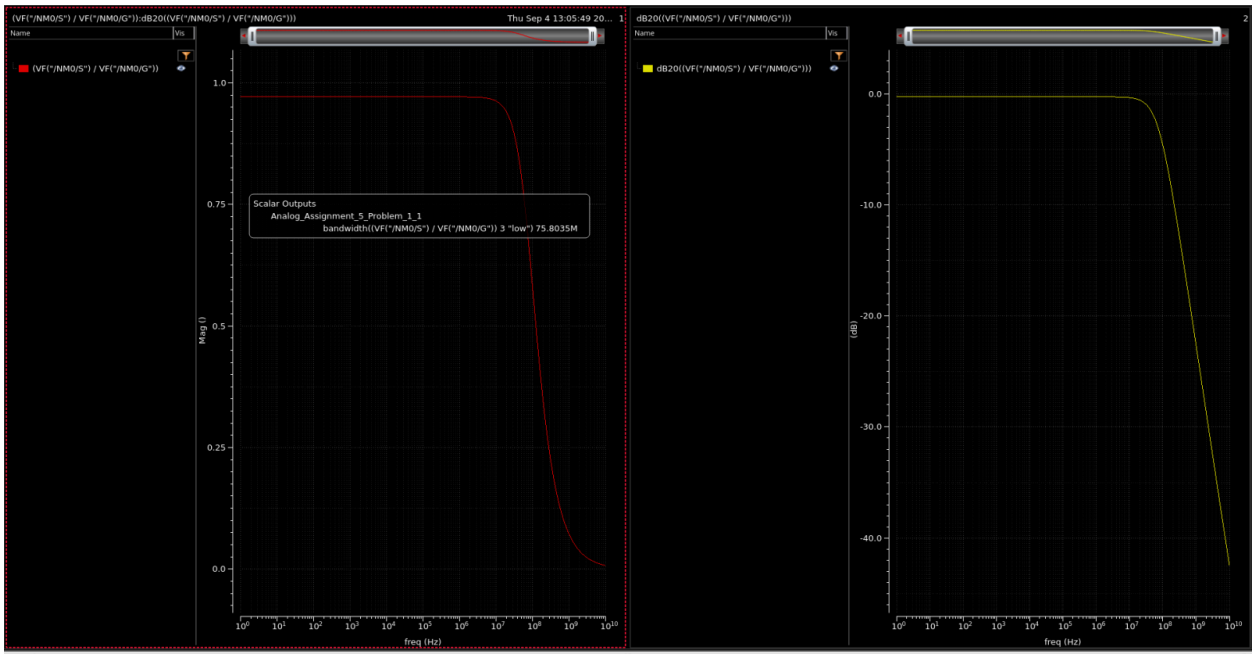
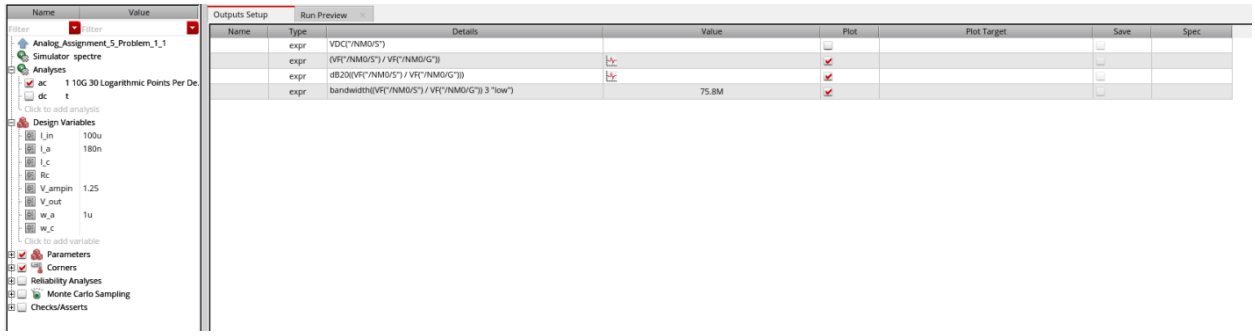
Analog Assignment-5

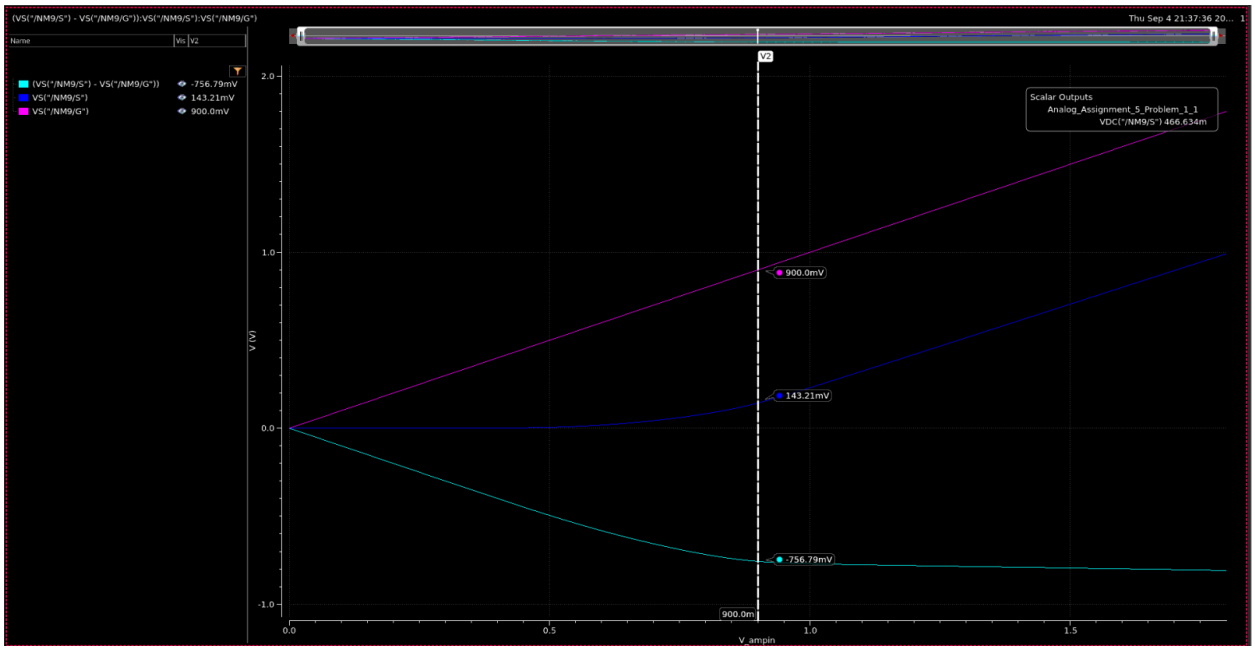
1.



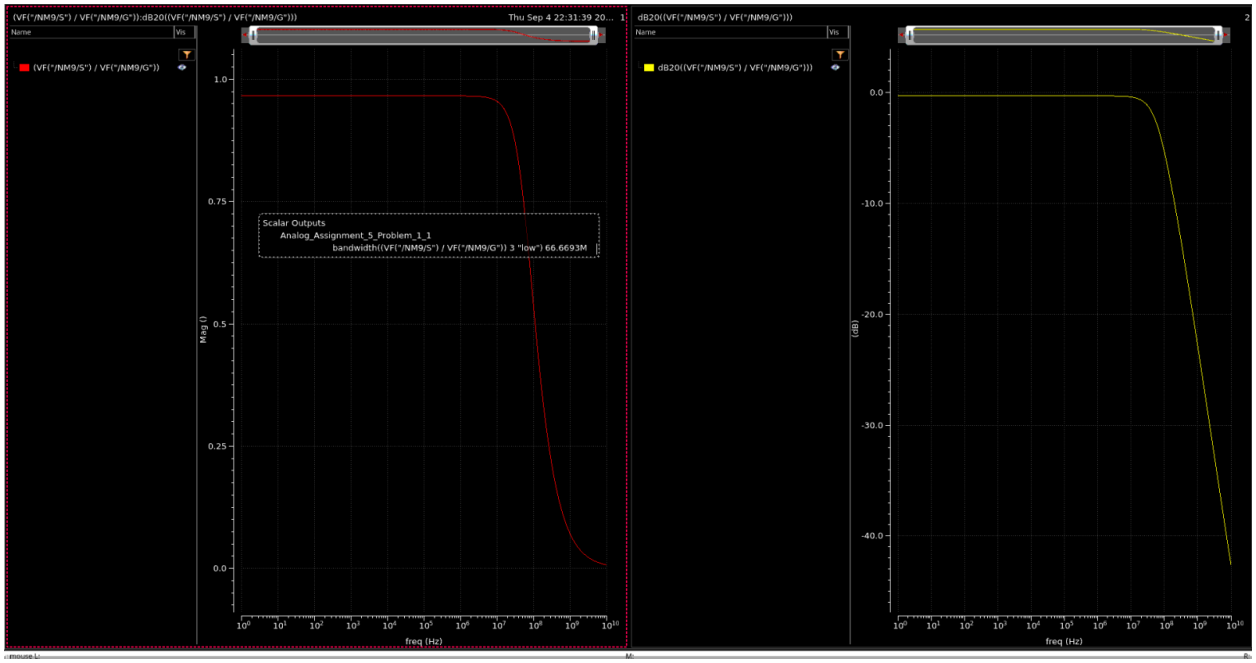



(VF("/NM0/S") / VF("/NM0/G")):dB20((VF("/NM0/S") / VF("/NM0/G")))
Thu Sep 4 13:05:49 20...
Name
Vis
(VF("/NM0/S") / VF("/NM0/G"))
Scalar Outputs
Analog_Assignment_5_Problem_1_1
bandwidth((VF("/NM0/S") / VF("/NM0/G"))) 3 "low") 75.8035M
Mag ()
freq (Hz)
dB20((VF("/NM0/S") / VF("/NM0/G")))
dB20((VF("/NM0/S") / VF("/NM0/G")))
(dB)
freq (Hz)

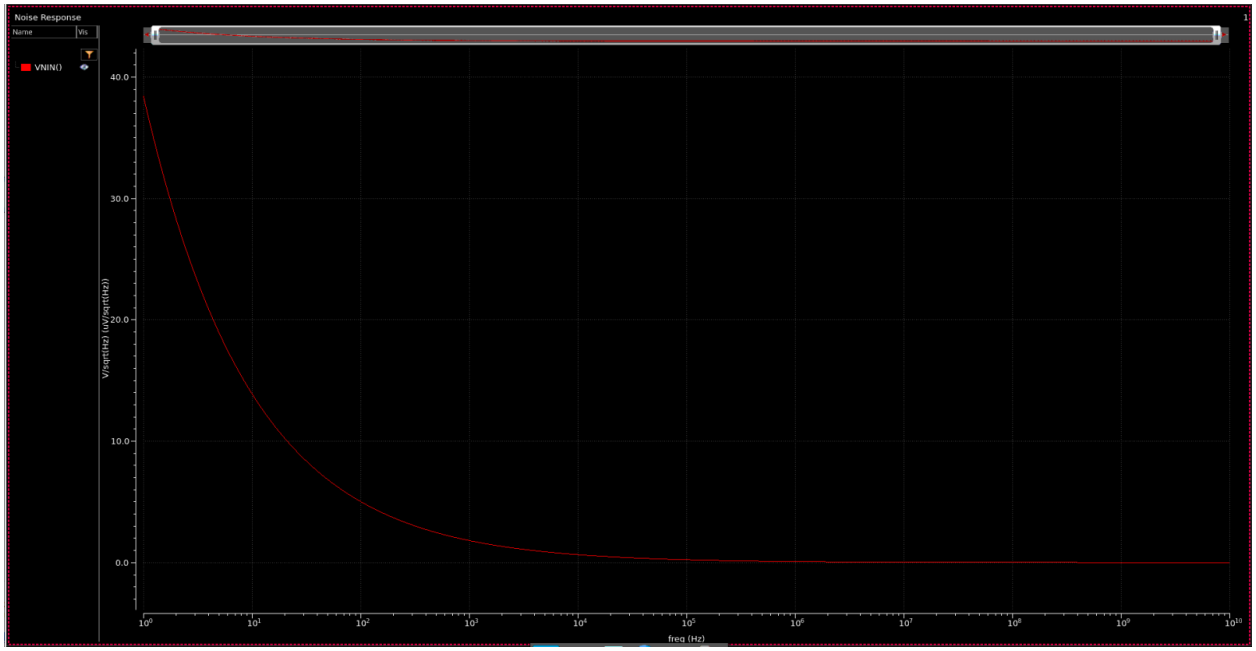

Name
Value
Analog_Assignment_5_Problem_1_1
Simulator spectre
Analyses
ac 1 10G 30 Logarithmic Points Per De...
dc t
Design Variables
I_in 100u
I_a 180n
I_c
Rc
V_ampin 1.25
V_out
w_a 1u
w_c
Parameters
Corners
Reliability Analyses
Monte Carlo Sampling
Checks/Asserts
Outputs Setup
Run Preview
Name
Type
Details
Value
Plot
Plot Target
Save
Spec
expr VDC("/NM0/S")
expr (VF("/NM0/S") / VF("/NM0/G"))
expr dB20((VF("/NM0/S") / VF("/NM0/G")))
expr bandwidth((VF("/NM0/S") / VF("/NM0/G"))) 3 "low") 75.8M


(VS("/NM9/S") - VS("/NM9/G")):VS("/NM9/S"):VS("/NM9/G")
Thu Sep 4 21:37:36 20...
Name
Vis
V2
(VS("/NM9/S") - VS("/NM9/G")) -756.79mV
VS("/NM9/S") 143.21mV
VS("/NM9/G") 900.0mV
Scalar Outputs
Analog_Assignment_5_Problem_1_1
VDC("/NM9/S") 466.634m
900.0mV
143.21mV
-756.79mV
V (V)
V_ampin

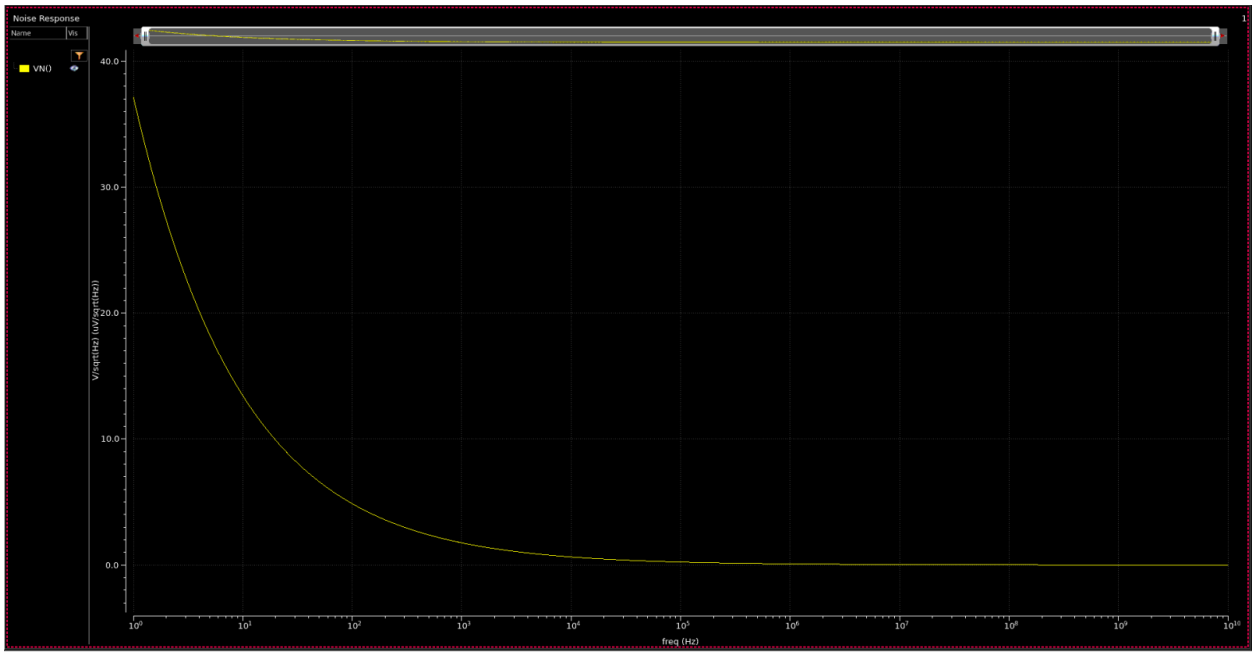
c.



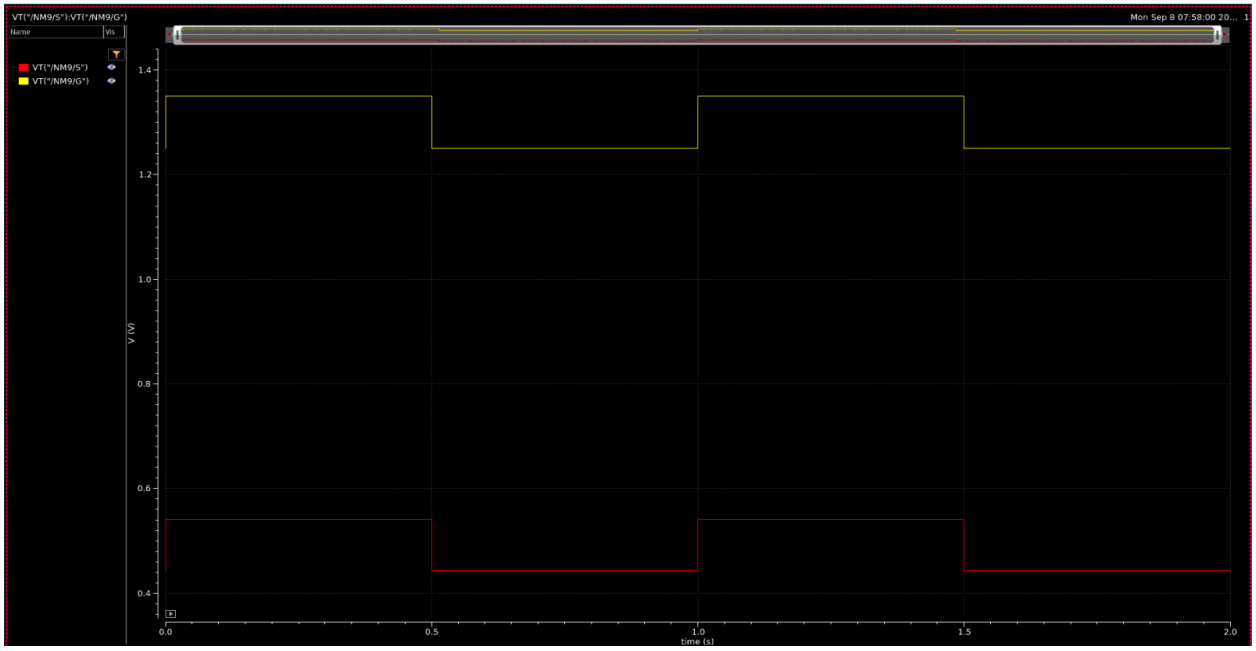
d. Input referred voltage noise.



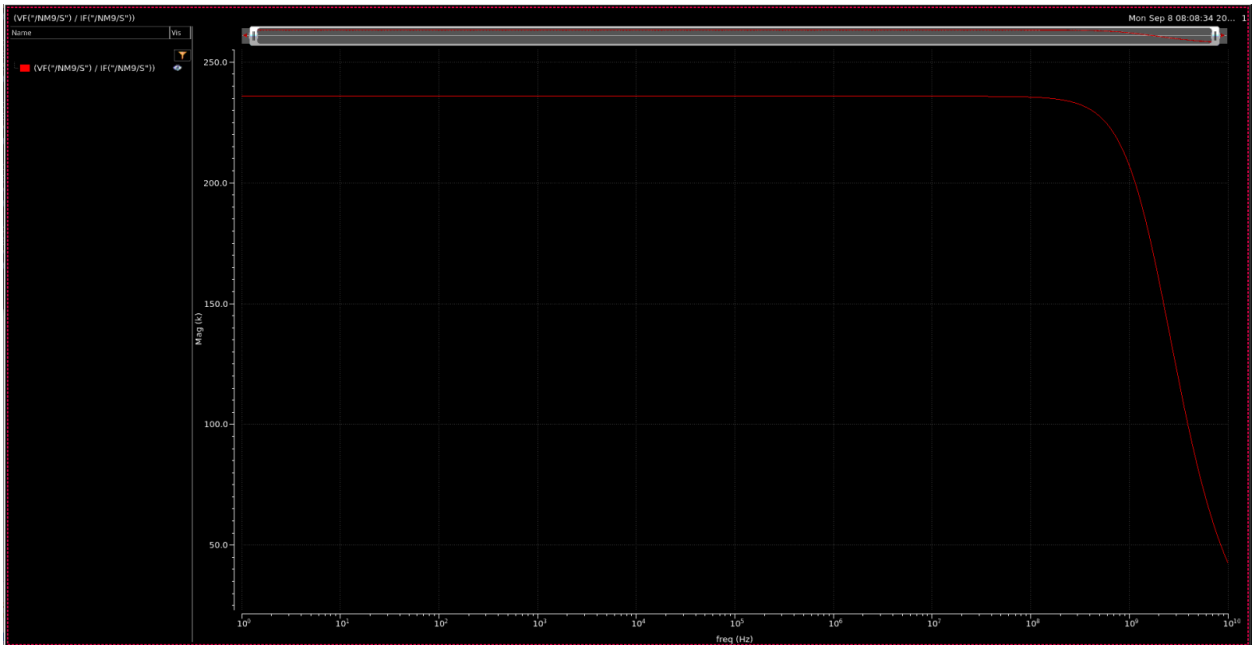
Output noise



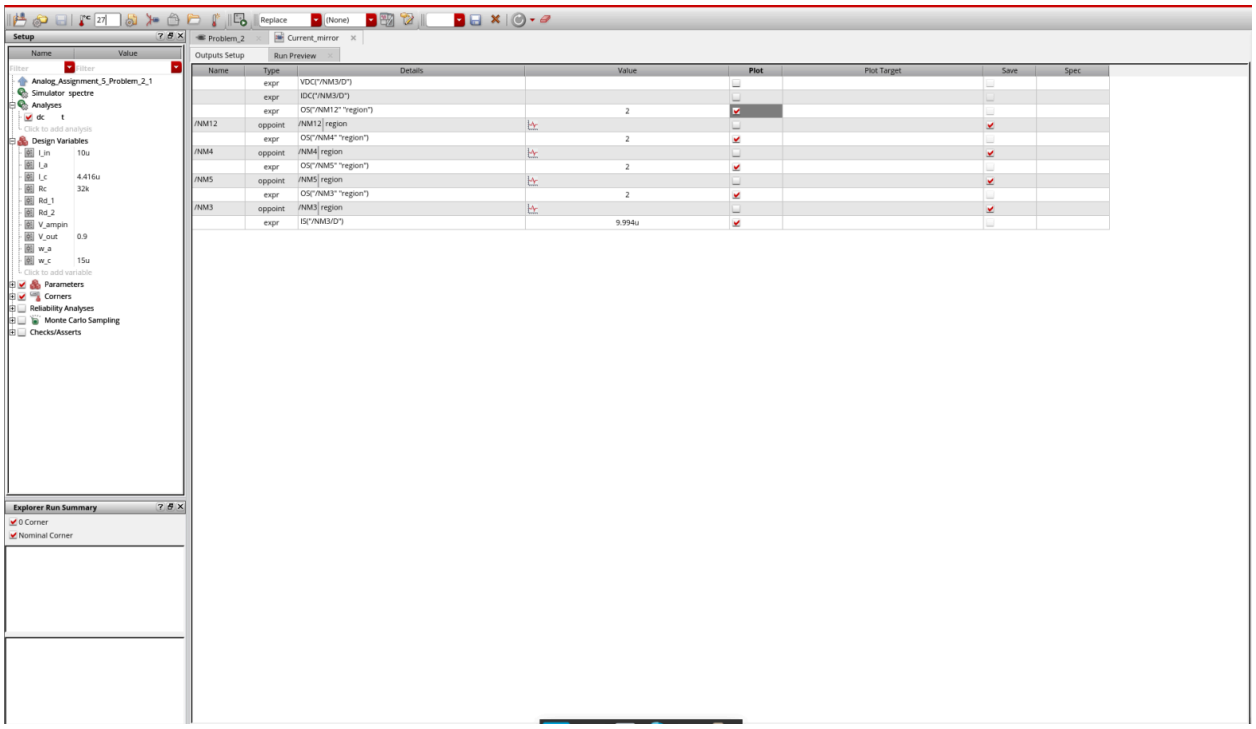
e.



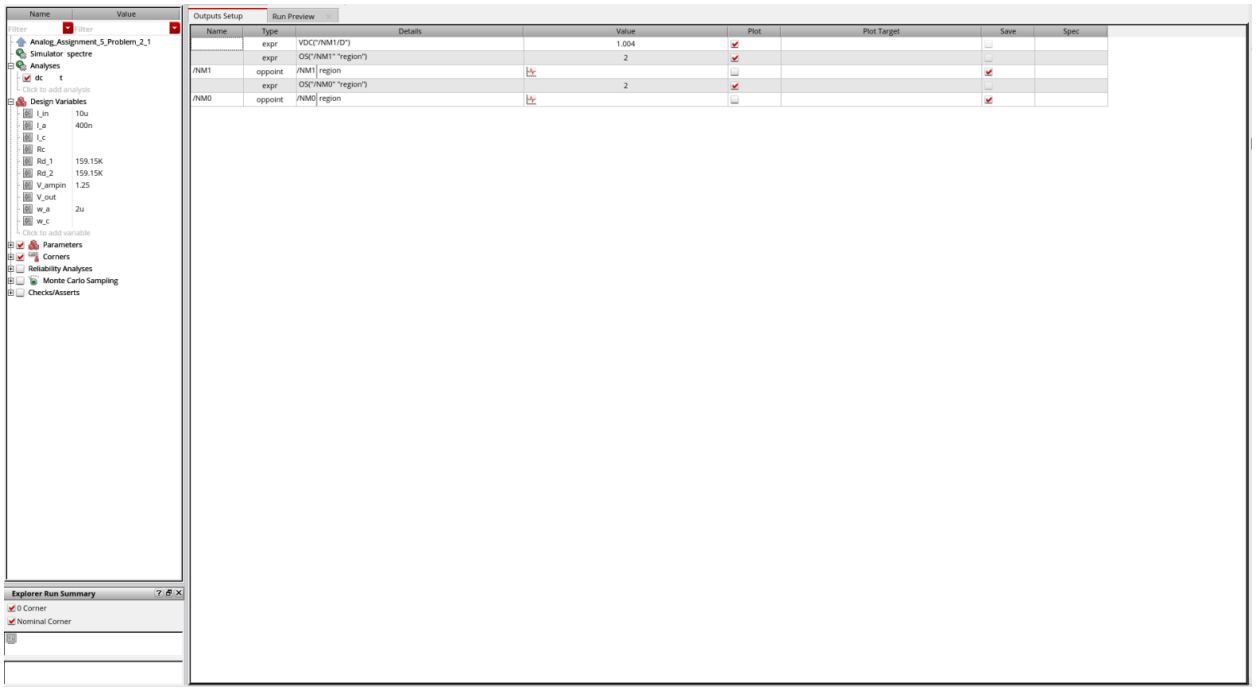
f.


(VF("/NM9/S") / IF("/NM9/S"))
Mon Sep 8 08:08:34 20...
Name
Vis
(VF("/NM9/S") / IF("/NM9/S"))
250.0
200.0
150.0
100.0
50.0
Mag (k)
freq (Hz)

Problem_2
Current mirror design with nmos in saturation



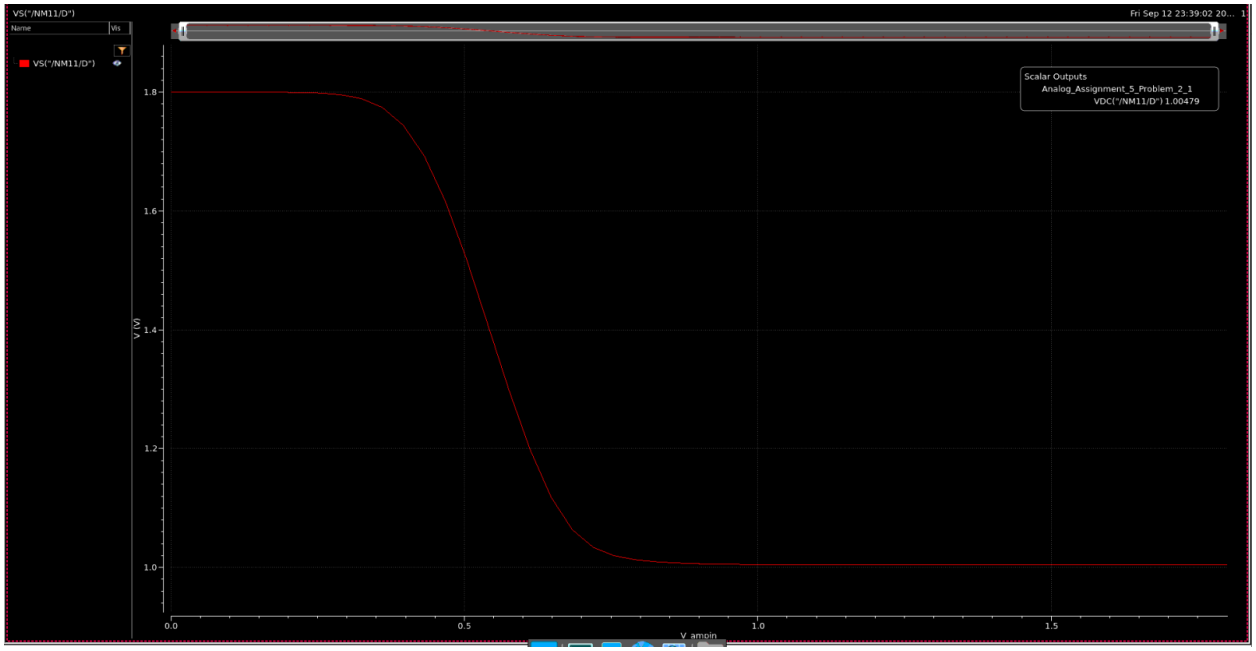
Top circuit design parameters with nmos in saturation



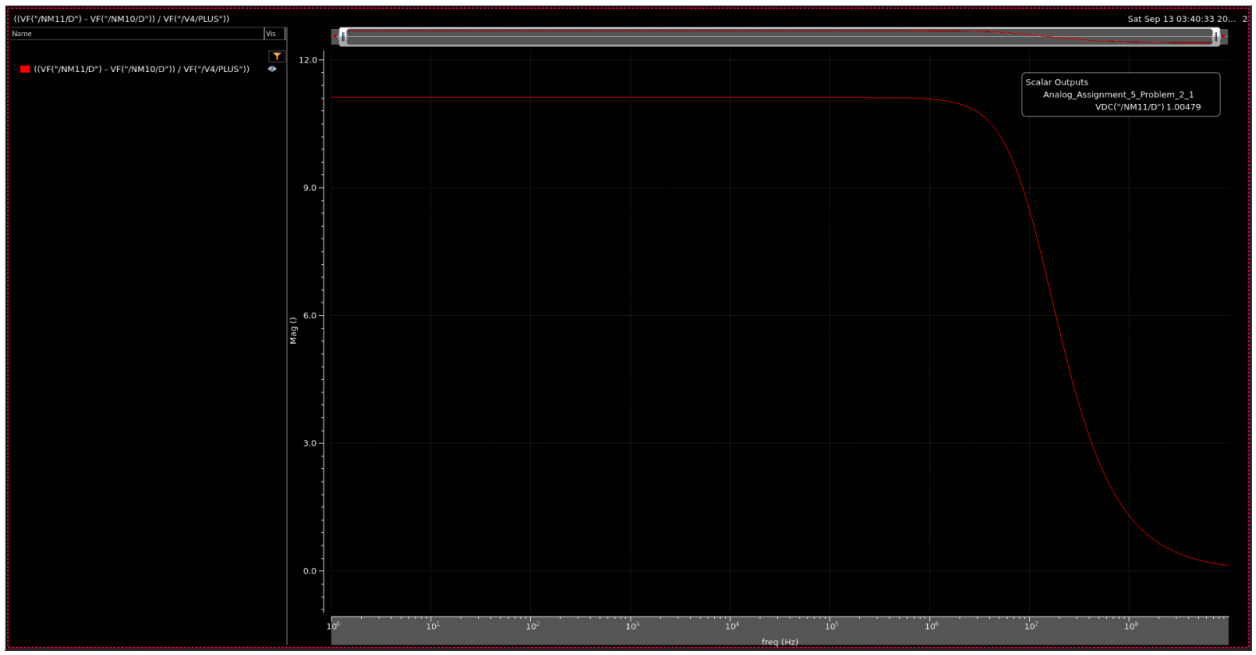
b.

The **input common-mode range (ICMR)** is the range of **DC input voltage (Vdc)** for which an amplifier (like a MOS differential amplifier) operates properly and maintains input–output linearity.

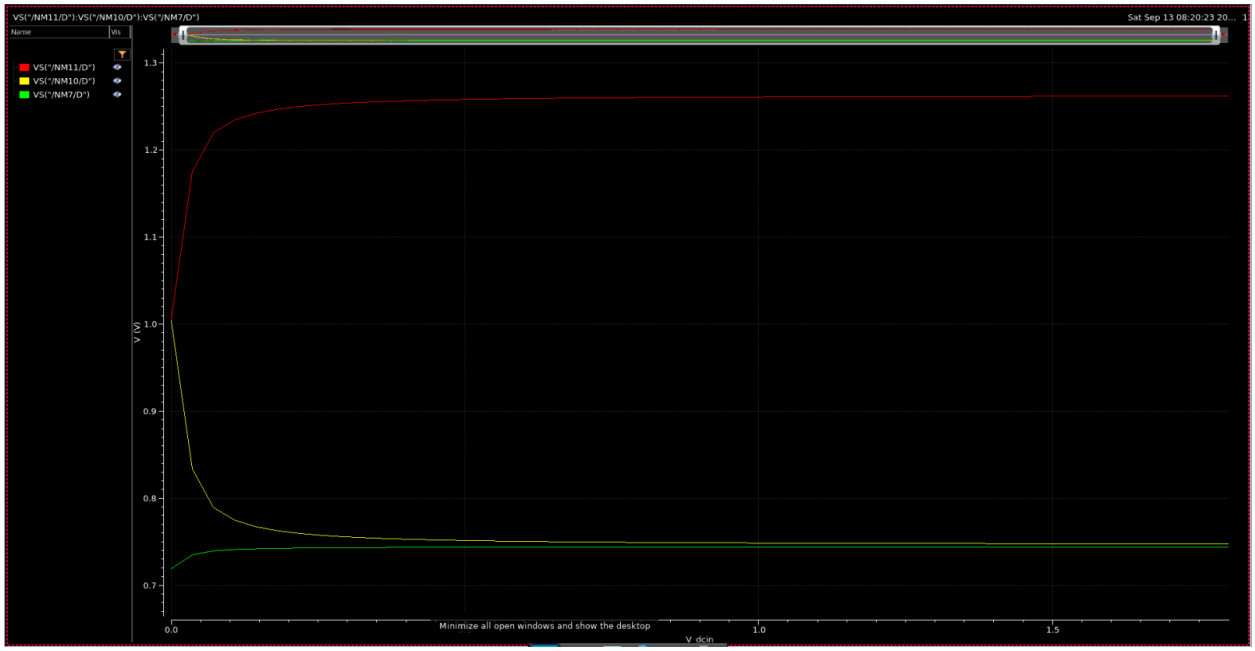
The range of Vdc for which amplifier operates in input-output linearity is 380 mV to 680 mV.



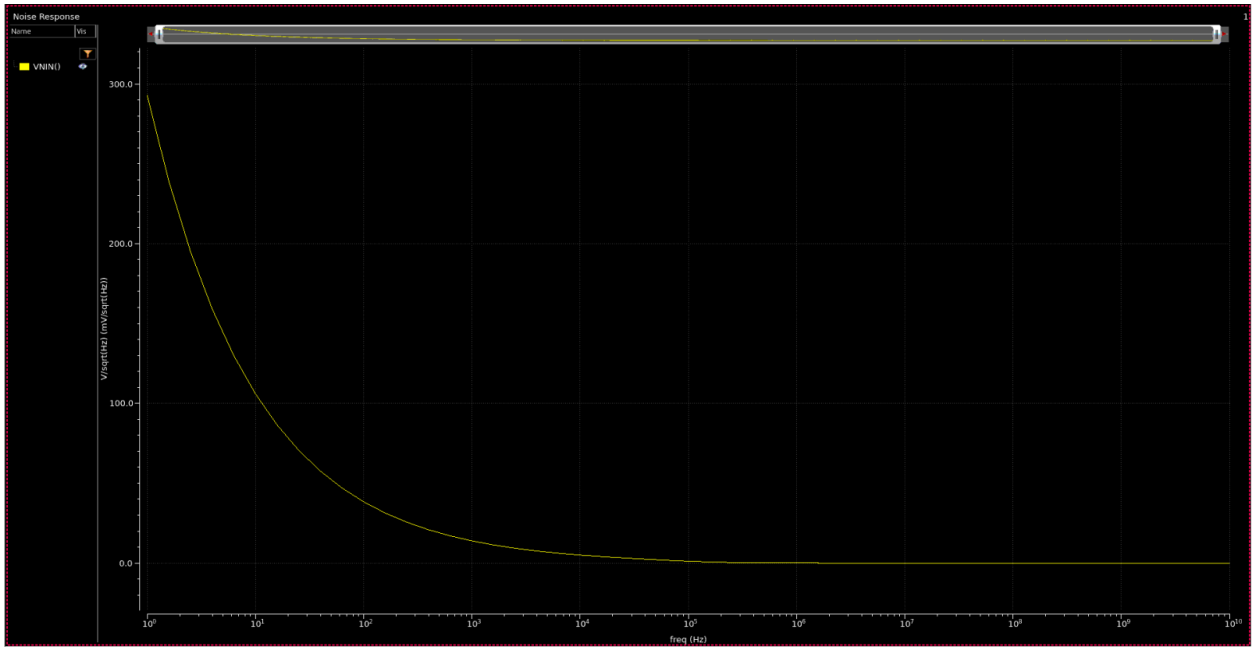
c.

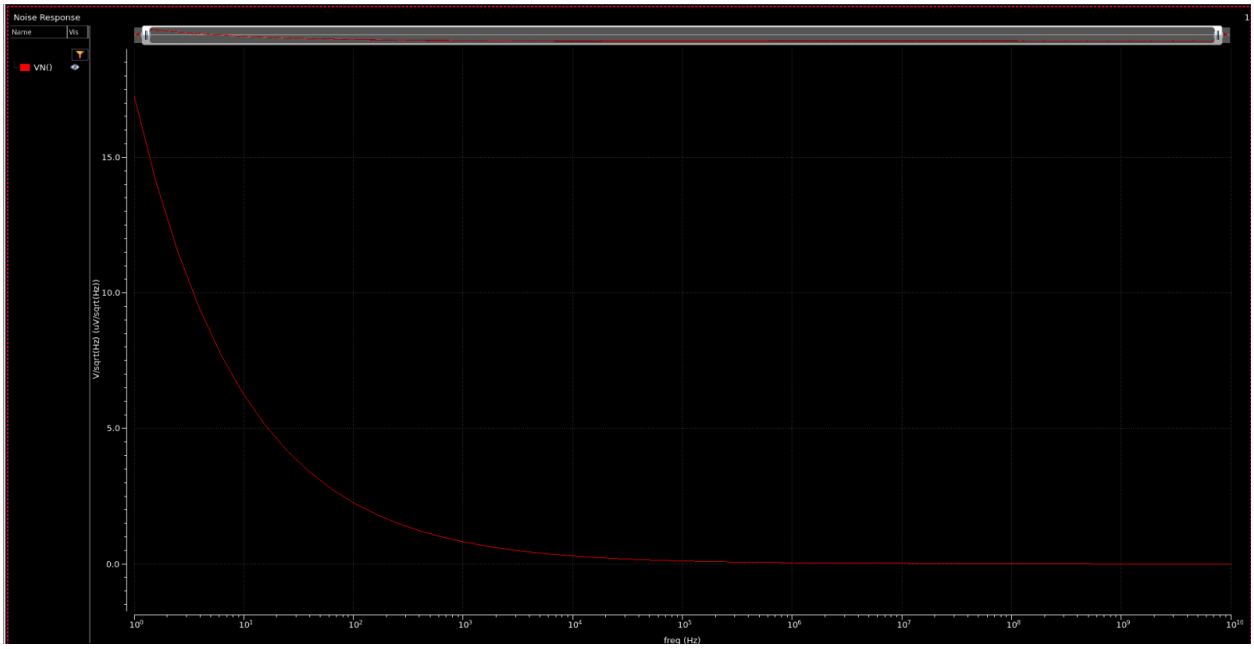


d.

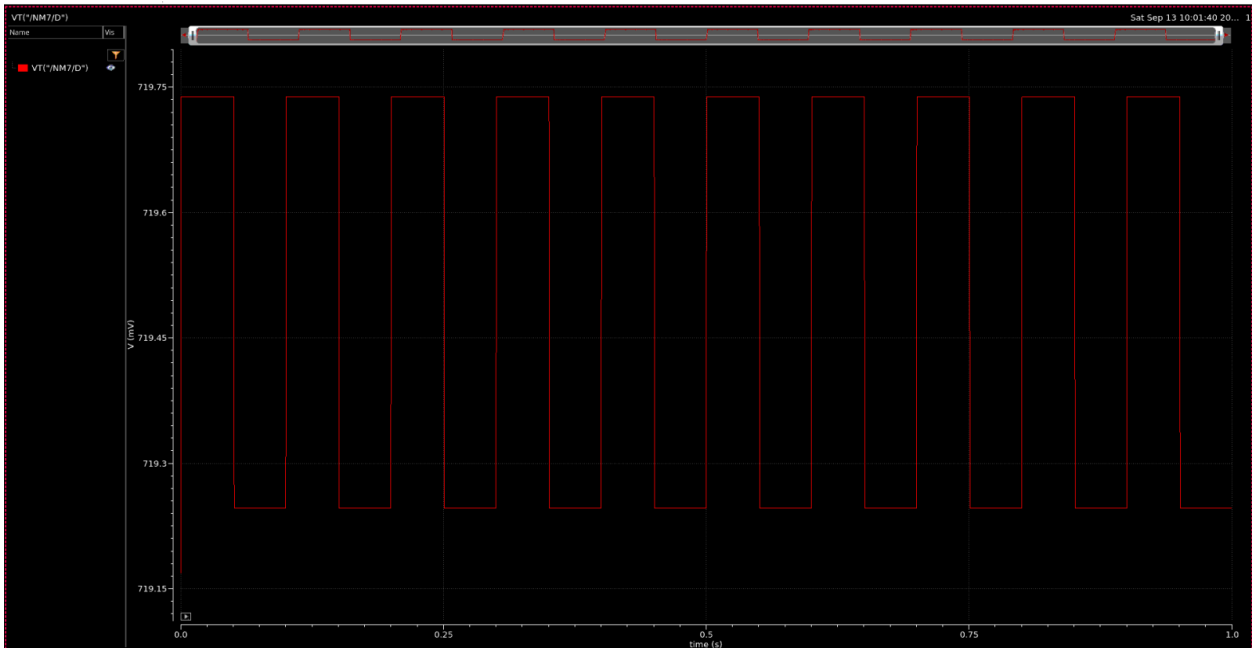

VS("/NM11/D"):VS("/NM10/D"):VS("/NM7/D")
Sat Sep 13 08:20:23 20...
Name
Vis
VS("/NM11/D")
VS("/NM10/D")
VS("/NM7/D")
1.3
1.2
1.1
1.0
0.9
0.8
0.7
V (V)
0.0
1.0
1.5
V_dcin
Minimize all open windows and show the desktop

e.


Noise Response
Name
Vis
VNIN()
300.0
200.0
100.0
0.0
V/sqrt(Hz) (nV/sqrt(Hz))
freq (Hz)

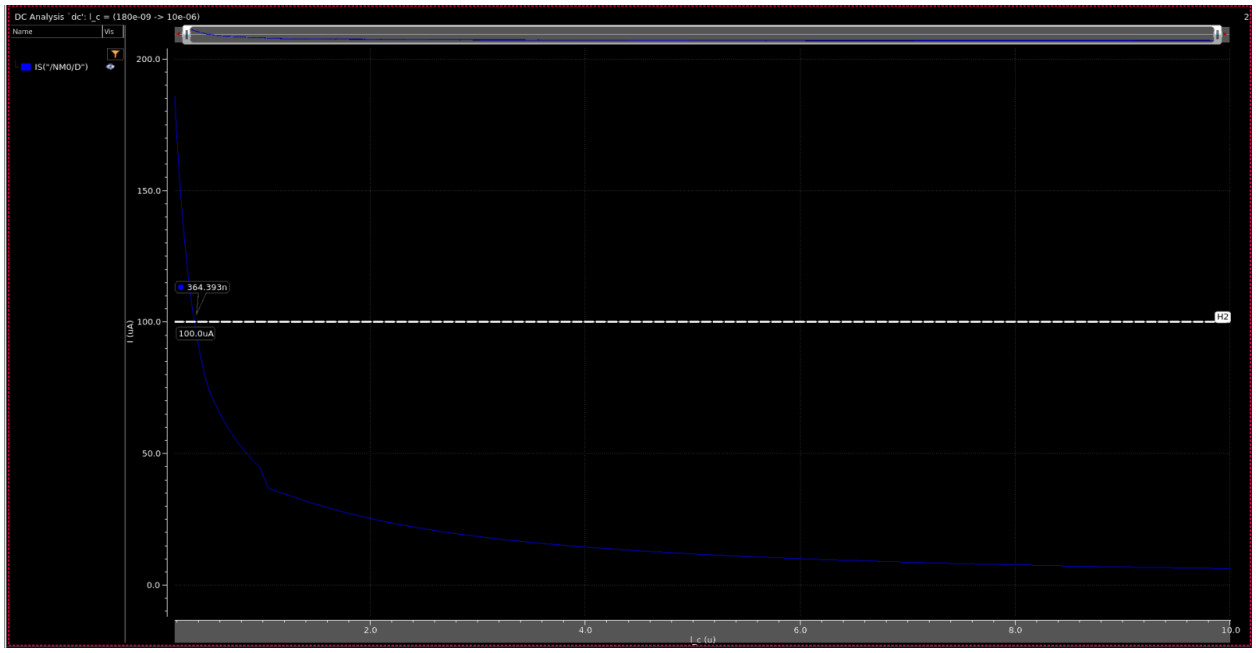

Noise Response
Name
Vis
VN()
15.0
10.0
5.0
0.0
V/sqrt(Hz) (uV/sqrt(Hz))
freq (Hz)

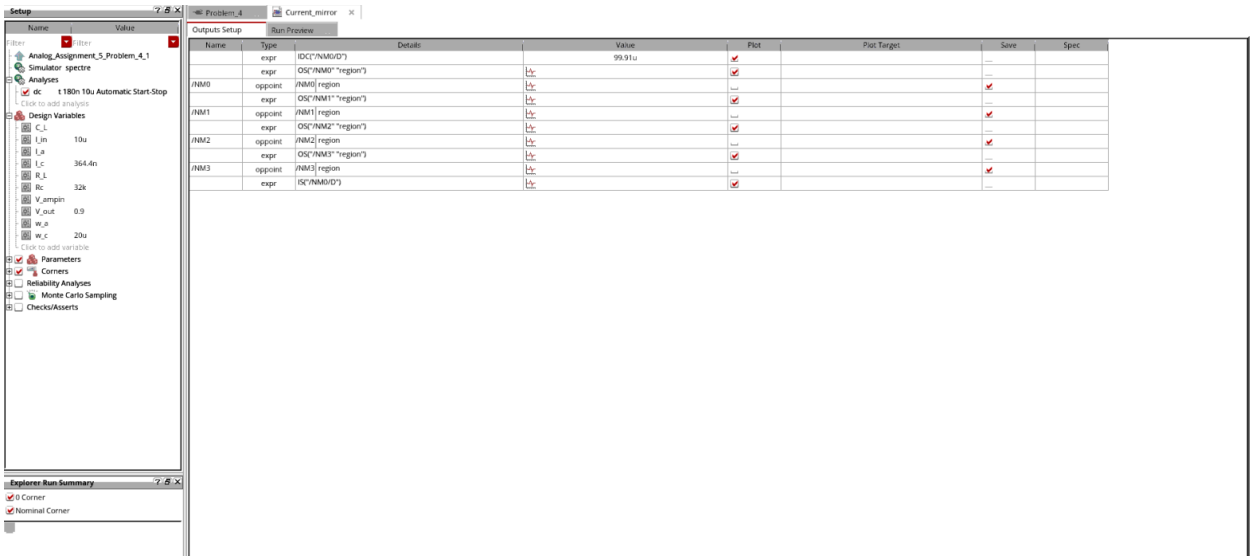
f.


VT(*/NM7/D*)
Sat Sep 13 10:01:40 20...
Name
Vis
VT(*/NM7/D*)
719.75
719.6
719.45
719.3
719.15
V (mV)
0.0
0.25
0.5
0.75
1.0
time (s)

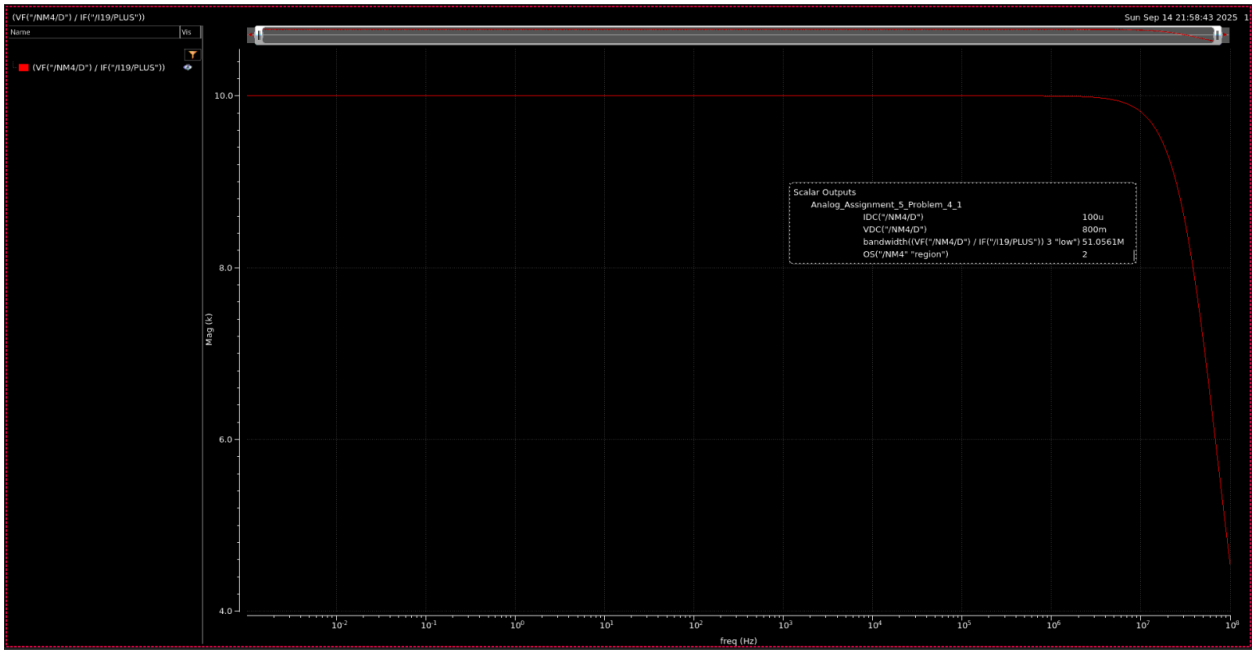
4.

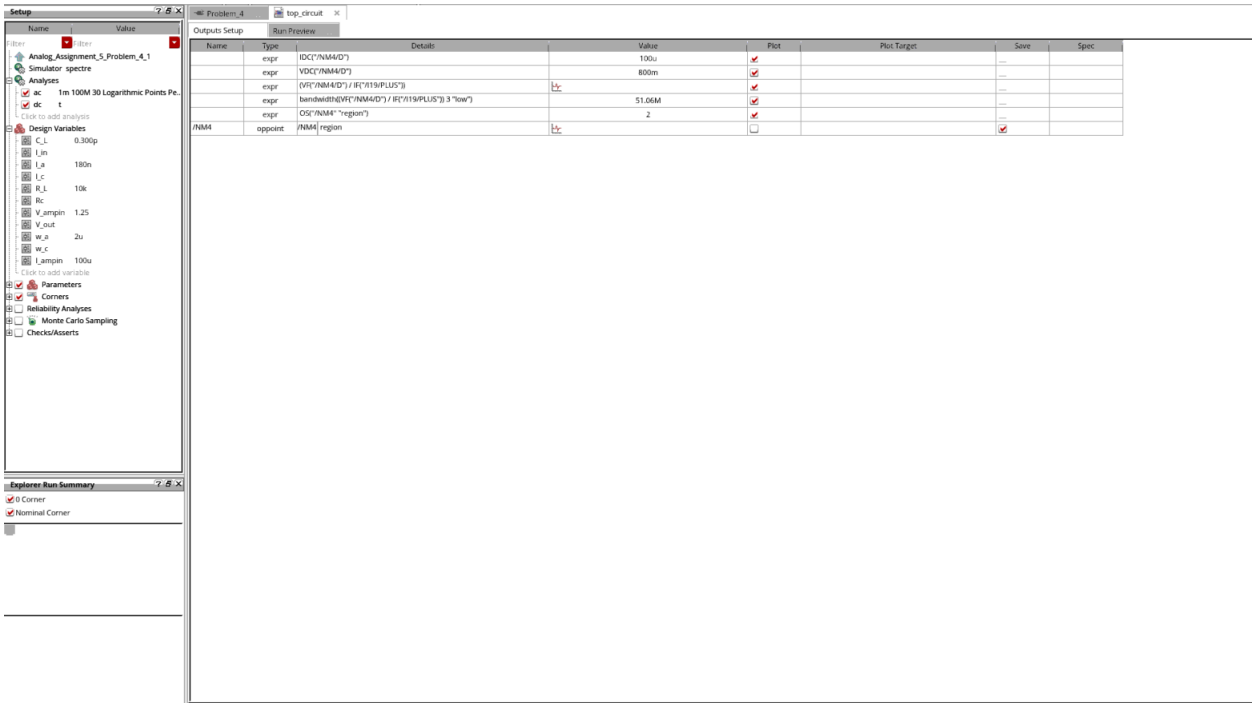
a. current mirror design



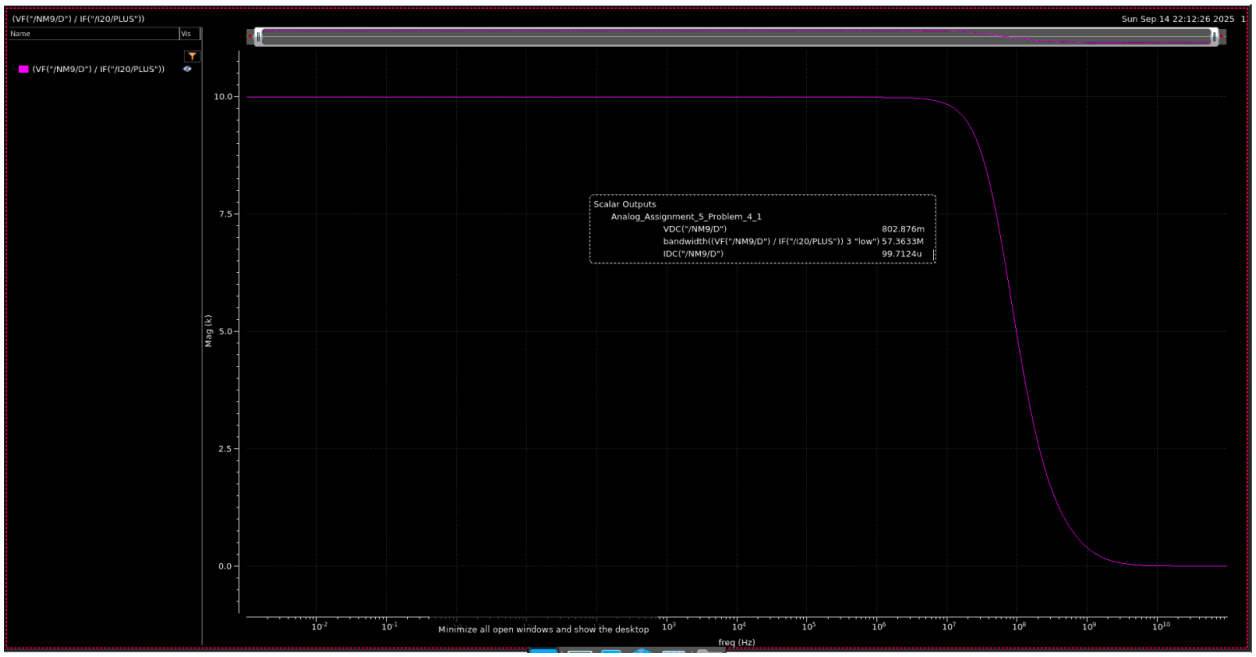


Gain is provided as 10k, hence Ra~=10k ohm considered.


(VF("/NM4/D") / IF("/I19/PLUS"))
Sun Sep 14 21:58:43 2025
Name
Vis
(VF("/NM4/D") / IF("/I19/PLUS"))
10.0
8.0
6.0
4.0
Mag (k)
freq (Hz)
Scalar Outputs
Analog_Assignment_5_Problem_4_1
IDC("/NM4/D") 100u
VDC("/NM4/D") 800m
bandwidth((VF("/NM4/D") / IF("/I19/PLUS"))) 3 "low") 51.0561M
OS("/NM4" "region") 2

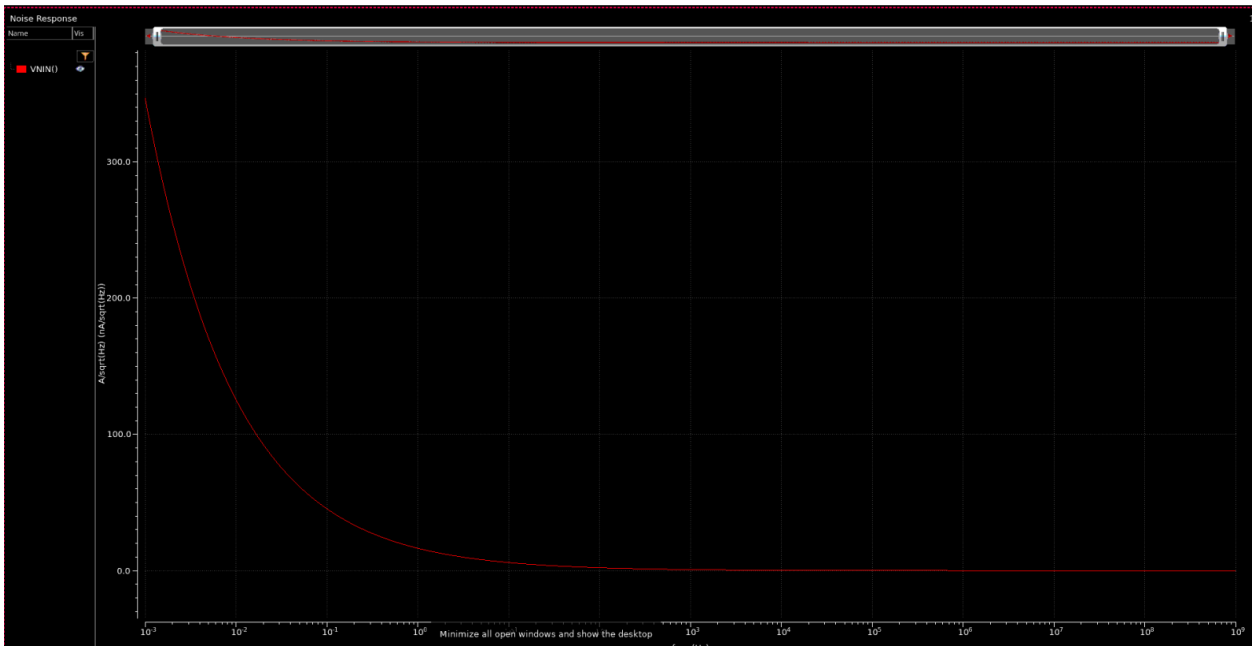

Setup
Name
Value
Analog_Assignment_5_Problem_4_1
Simulator spectre
Analyses
ac 1m 100M 30 Logarithmic Points Pe..
dc t
Design Variables
C_L 0.300p
I_in
I_a 180n
I_c
R_L 10k
Rc
V_ampin 1.25
V_out
w_a 2u
w_c
I_ampin 100u
Parameters
Corners
Reliability Analyses
Monte Carlo Sampling
Checks/Asserts
Explorer Run Summary
0 Corner
Nominal Corner
Problem_4
top_circuit
Outputs Setup
Run Preview
Name
Type
Details
Value
Plot
Plot Target
Save
Spec
expr IDC("/NM4/D") 100u
expr VDC("/NM4/D") 800m
expr (VF("/NM4/D") / IF("/I19/PLUS"))
expr bandwidth((VF("/NM4/D") / IF("/I19/PLUS"))) 3 "low") 51.06M
expr OS("/NM4" "region") 2
/NM4 oppoint /NM4 region

b.

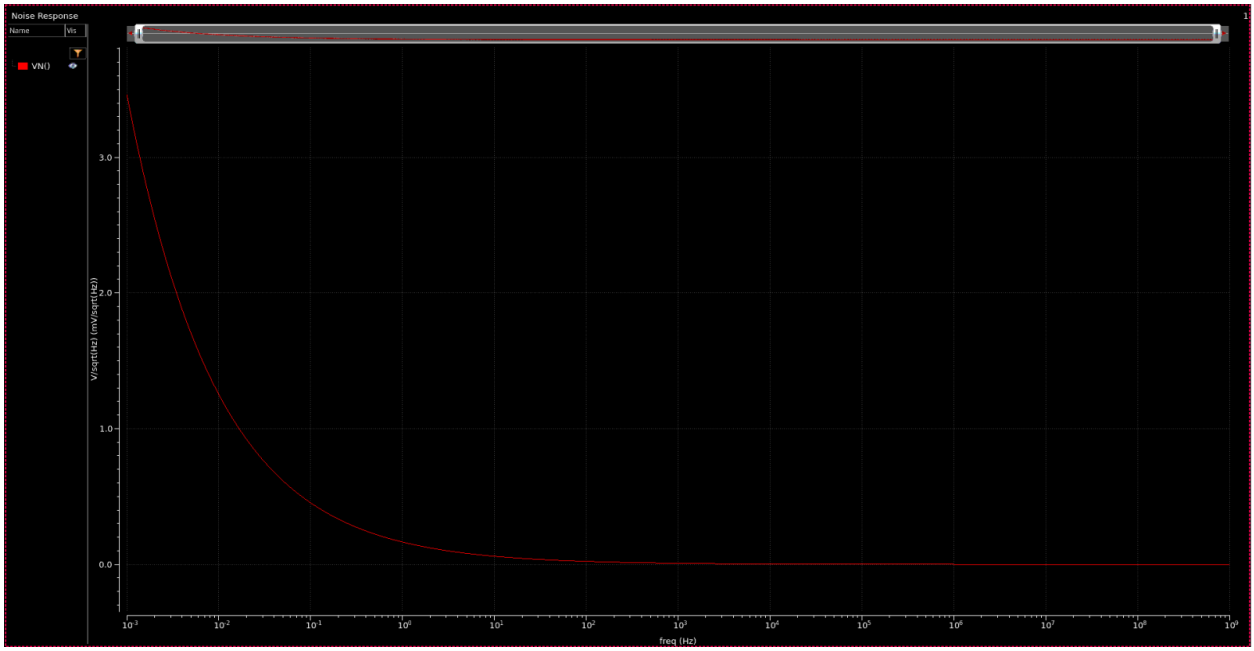


c.

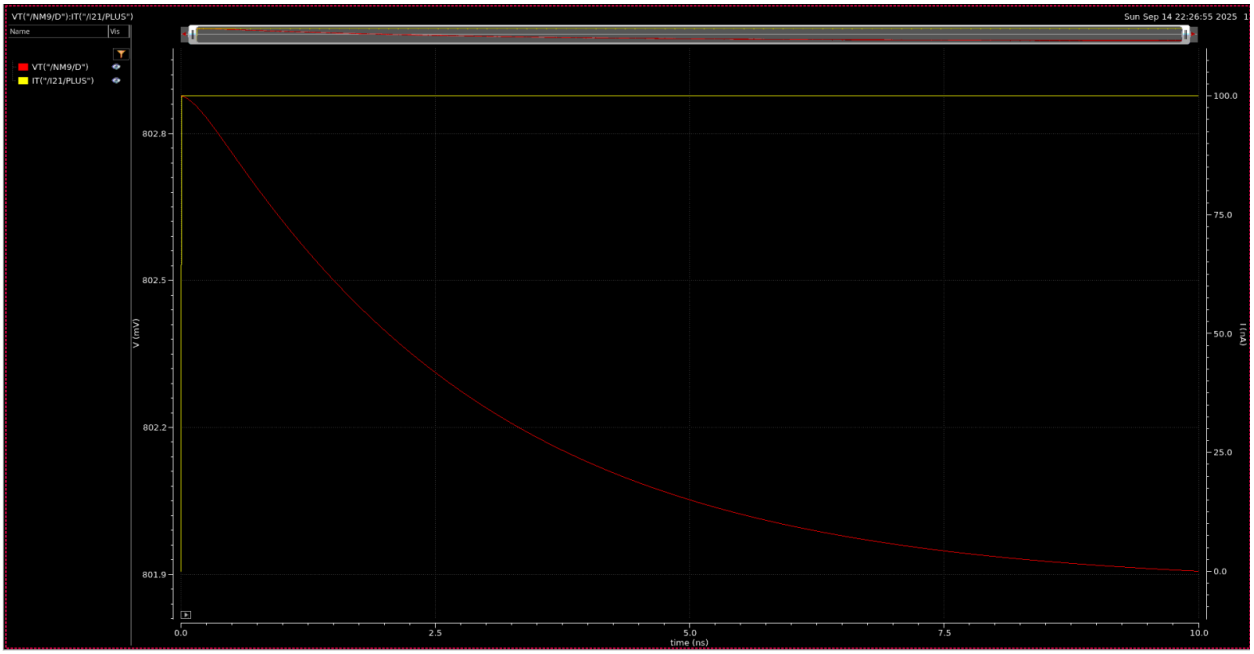
Input referred Noise



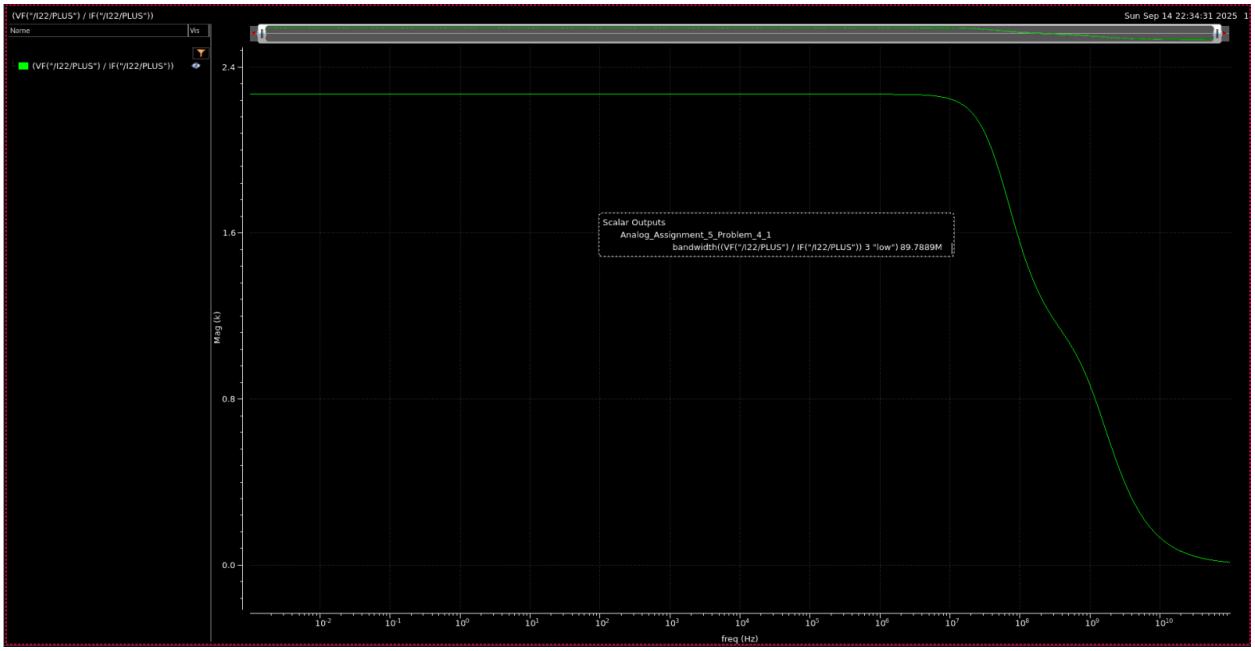
Output referred noise



d.



e.


(VF("/I22/PLUS") / IF("/I22/PLUS"))
Sun Sep 14 22:34:31 2025
Name
Vis
(VF("/I22/PLUS") / IF("/I22/PLUS"))
2.4
1.6
0.8
0.0
Mag (x)
Scalar Outputs
Analog_Assignment_5_Problem_4_1
bandwidth((VF("/I22/PLUS") / IF("/I22/PLUS")) 3 "low") 89.7889M
freq (Hz)