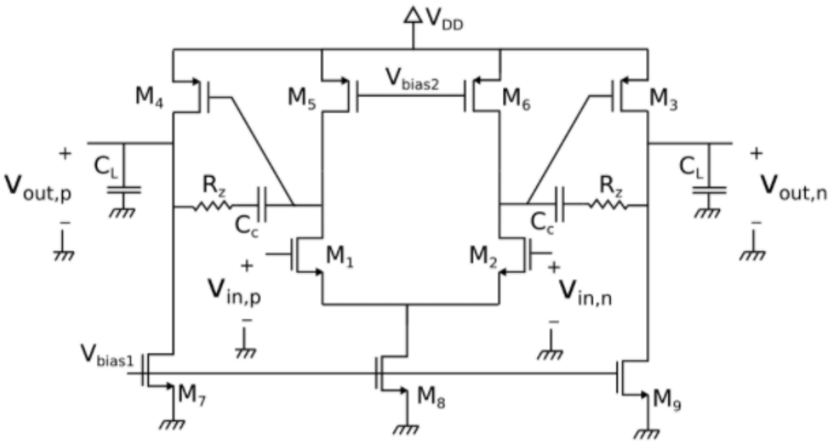
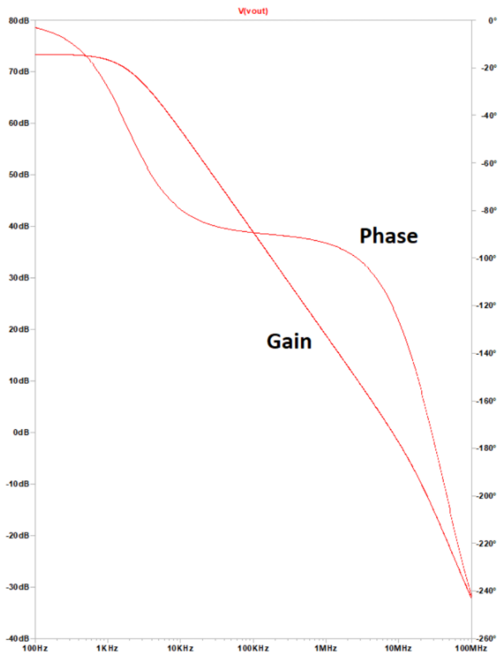
Evaluation Test I

1. Given the following fully-differential Miller circuit, what could we do to increase the gain at low frequencies?



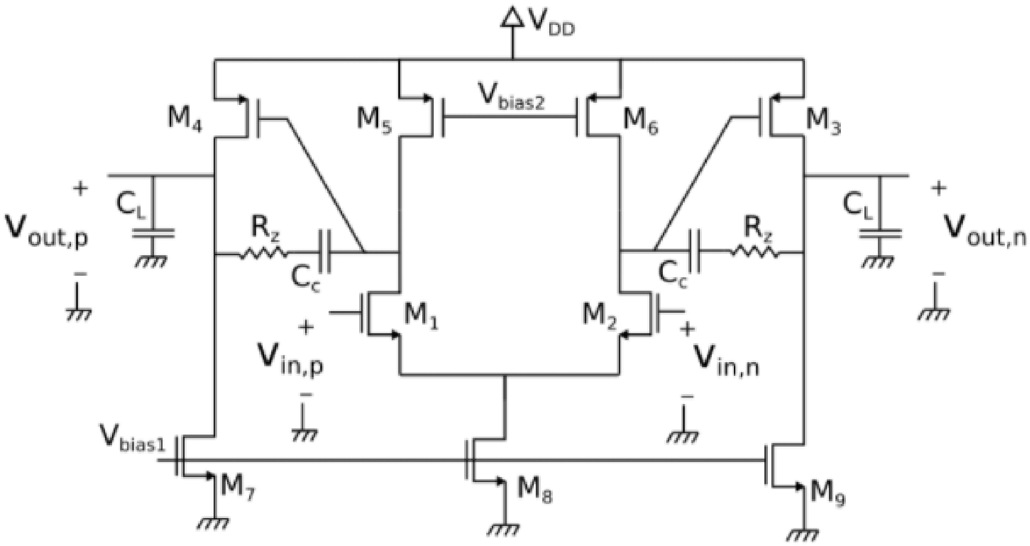
- a) Increasing the aspect ratio W/L of M1.
- b) Decreasing the aspect ratio W/L of M3.
- c) Increasing capacitor C_L.
- d) Decreasing capacitor C_C.

2. Given the following open-loop frequency response measured in a Miller operational amplifier, what is the measured margin phase?



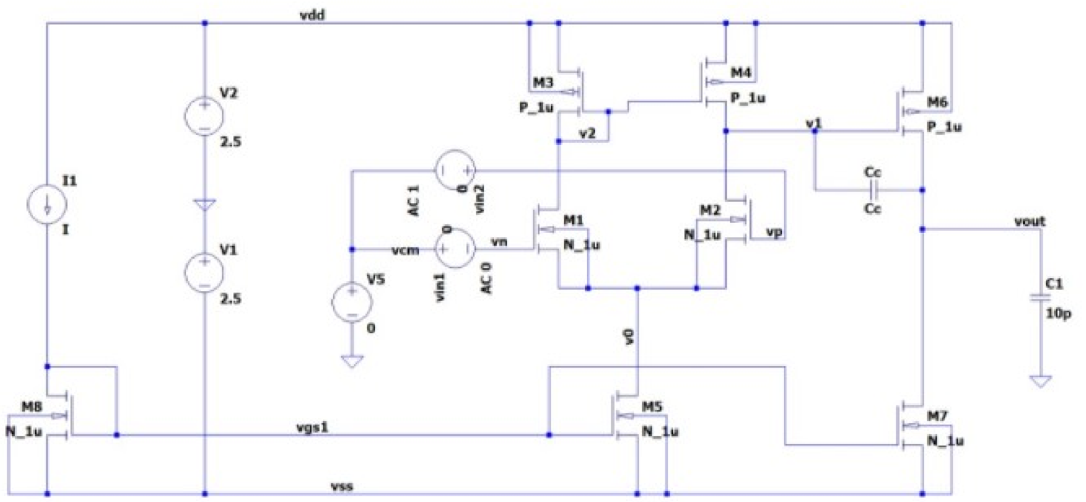
- a) 70º
- b) 110º
- c) 10º
- d) 175º

3. Given the following fully-differential Miller circuit, what would happen if we decreased the bias current through M3 and M4?



a) The differential gain is decreased.
b) The differential gain is increased.
c) The phase margin is increased.
d) The phase margin is decreased.

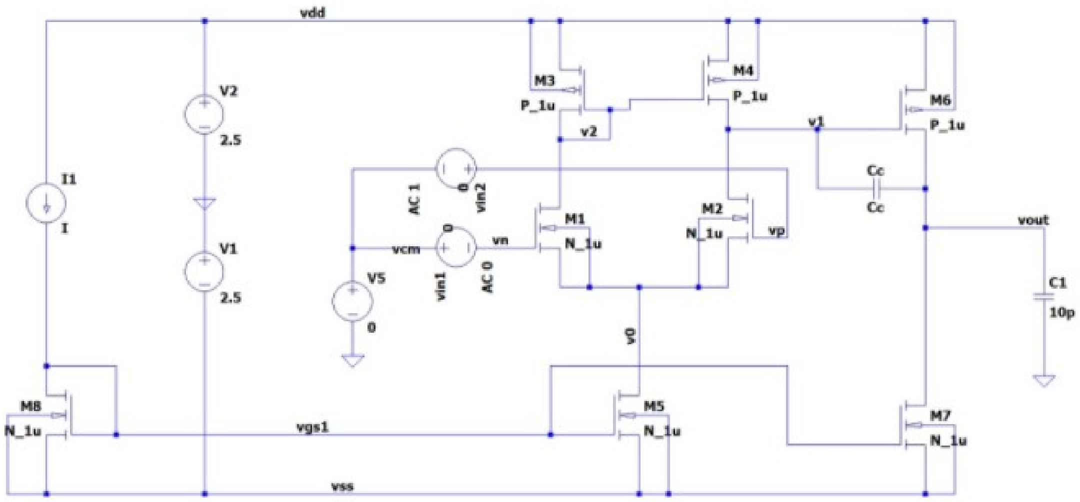
4. Compute the slew-rate of this amplifier:



Data: Cc=3pF,I=30µA,(W/L)1=(W/L)2=3,(W/L)3=(w/L)4=5,(W/L)8=(W/L)5=3, (W/L)6=80, (W/L)=18, L_{min}=1µm, K_P=40µA/V, λ_P(L=2µm)=0.02V^{-1},V_{tp}=-0.9V,K_N=120 µA/V, λ_n (L=2µm) = 0.02V^{-1}, V_{tn} = 0.8 V

a) 10V/µs.
b) 60V/µs.
c) 5V/µs.
d) 30V/µs.

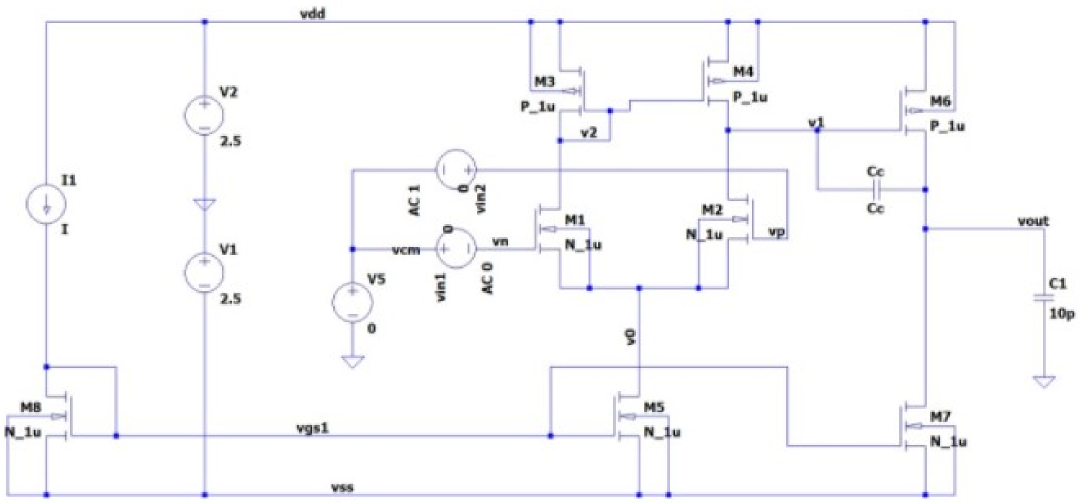
5. Compute the power consumption of this amplifier excluding M8 branch:



Data: Cc=3pF, I=30µA, $(W/L)_1=(W/L)_2=3$, $(W/L)_3=(w/L)_4=5$, $(W/L)_8=(W/L)_5=3$, $(W/L)_6=80$, $(W/L)=18$, $L_{min}=1\mu m$, $K_P=40\mu A/V$, $\lambda_P(L=2\mu m)=0.02V^{-1}$, $V_{tp}=-0.9V$, $K_N=120\ \mu A/V$, $\lambda_n\ (L=2\mu m) = 0.02V^{-1}$, $V_{tn} = 0.8\ V$

a) 1mW.
b) 0.5mW.
c) 2mW.
d) 0.15mW.

6. Compute the GBW of this amplifier:

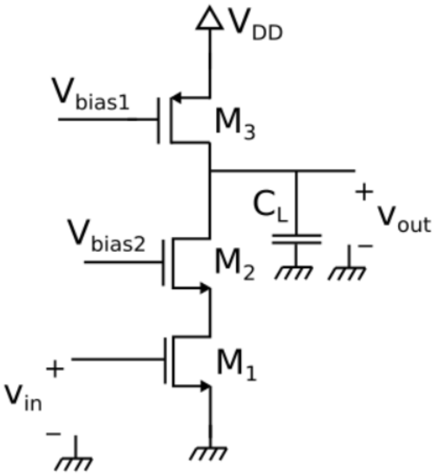


a) 5.5MHz.
b) 7.8MHz.
c) 3.9MHz.
d) 5MHz.

7. Which of the following OTA circuits achieves a high gain by means of amplifying a current?

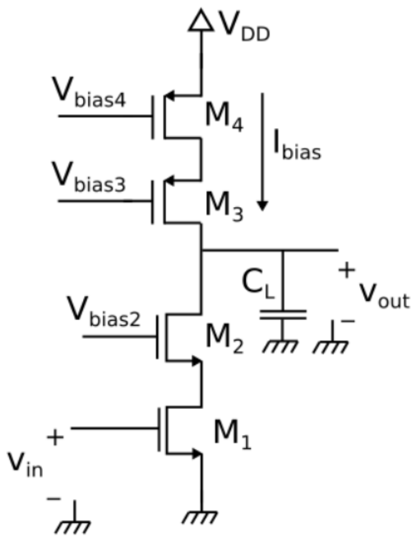
a) Folded-cascode OTA.
b) Telescopic OTA.
c) Symmetric OTA.
d) Miller OTA.

8. Given the following circuit, what is the gain vout/vin? Assume that all the transistors are working in saturation.



a) - gm1 (rds3 || (rds1rds2gm2))
b) gm1 (rds3 || (rds1rds2gm2))
c) - gm1 (rds3 || (rds1rds2gm1))
d) gm1 (rds3 || (rds1rds2gm1))

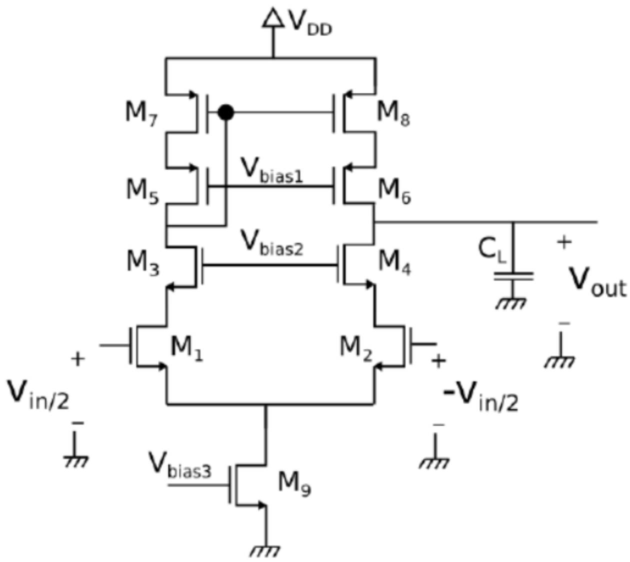
9. Given the following circuit, what is the aspect ratio (W/L) of M1 required to get a gain-bandwidth product (GBW) equal to 50 MHz? Assume that all the transistors are working in saturation, have a length L of 50 nm and Ibias = 100 uA.



Data: μ_pC_{ox} = 20 uA/V^2, μ_nC_{ox} = 60 uA/V^2, V_{thp} = -0.7 V, V_{thn} = 0.7 V, C_L = 3 pF.

a) 222.
b) 74.
c) 148.
d) 20.

10. What could you say about the following circuit?



a) It is a folded-cascode OTA which, for the same specifications, consumes less power than the telescopic OTA.
b) It is a folded-cascode OTA which, for the same specifications, consumes more power than the telescopic OTA.
c) It is a telescopic OTA which, for the same specifications, consumes more power than the folded-cascode OTA.
d) It is a telescopic OTA which, for the same specifications, consumes less power than the folded-cascode OTA.