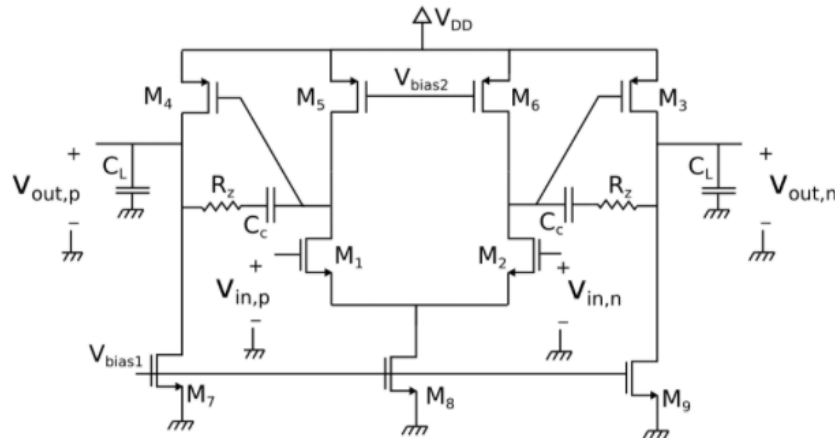
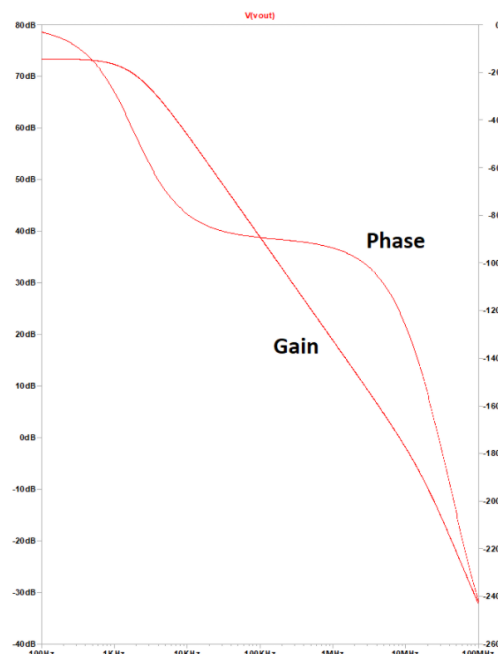


## Evaluation Test I

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

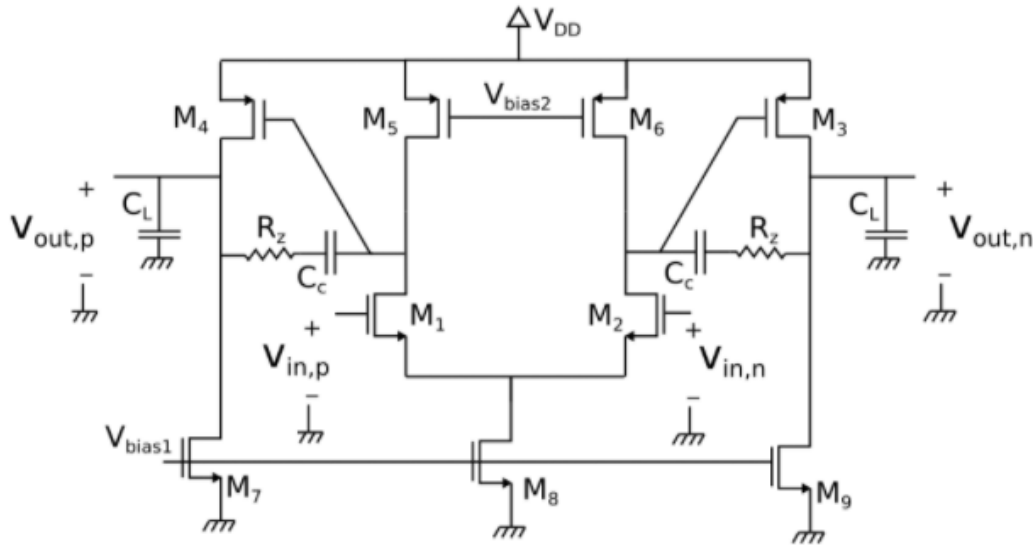


- Increasing the aspect ratio  $W/L$  of  $M_1$ .
  - Decreasing the aspect ratio  $W/L$  of  $M_3$ .
  - Increasing capacitor  $C_L$ .
  - Decreasing capacitor  $C_c$ .
2. Given the following open-loop frequency response measured in a Miller operational amplifier, what is the measured margin phase?



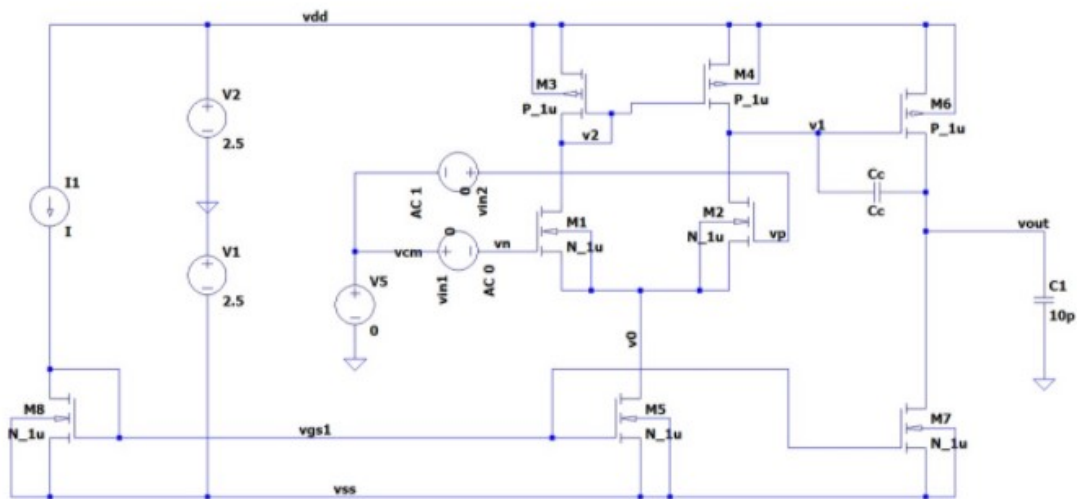
- 70°
- 110°
- 10°
- 175°

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.

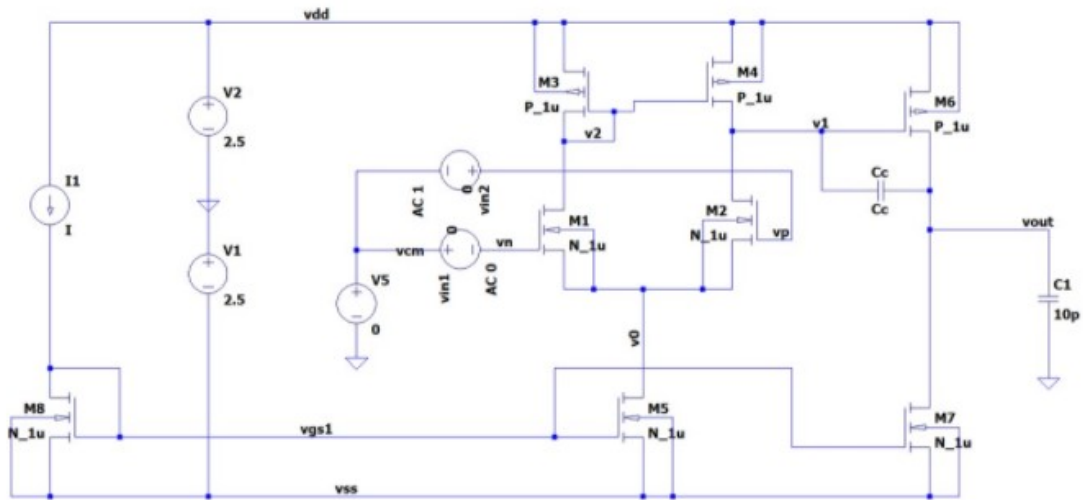
4. Compute the slew-rate of this amplifier:



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

- a)  $10\text{V}/\mu\text{s}$ .
- b)  $60\text{V}/\mu\text{s}$ .
- c)  $5\text{V}/\mu\text{s}$ .
- d)  $30\text{V}/\mu\text{s}$ .

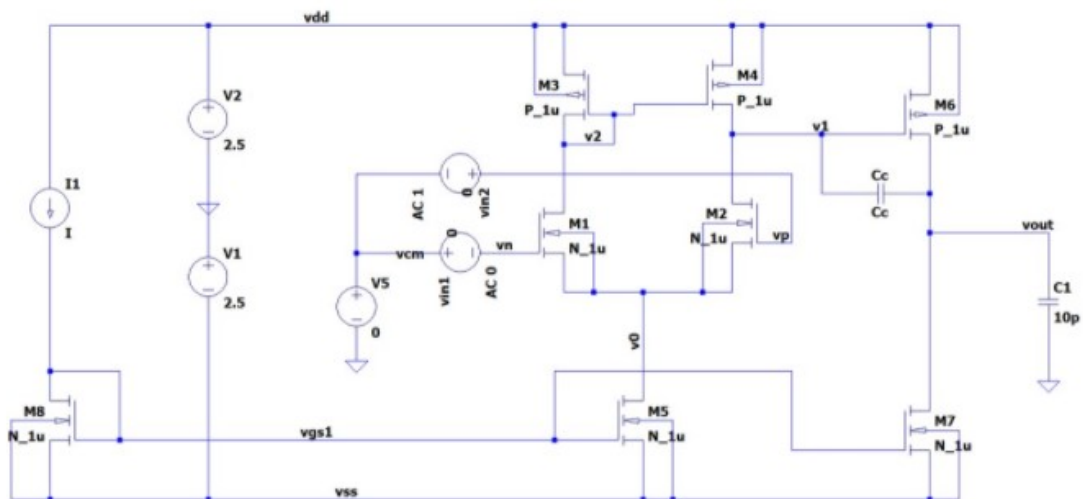
5. Compute the power consumption of this amplifier excluding M8 branch:



Data:  $C_c=3\text{pF}$ ,  $I=30\mu\text{A}$ ,  $(W/L)_1=(W/L)_2=3$ ,  $(W/L)_3=(W/L)_4=5$ ,  $(W/L)_8=(W/L)_5=3$ ,  $(W/L)_6=80$ ,  $(W/L)_7=18$ ,  $L_{\min}=1\mu\text{m}$ ,  $K_P=40\mu\text{A/V}$ ,  $\lambda_P(L=2\mu\text{m})=0.02\text{V}^{-1}$ ,  $V_{tp}=-0.9\text{V}$ ,  $K_N=120\mu\text{A/V}$ ,  $\lambda_n(L=2\mu\text{m})=0.02\text{V}^{-1}$ ,  $V_{tn}=0.8\text{V}$

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

6. Compute the GBW of this amplifier:

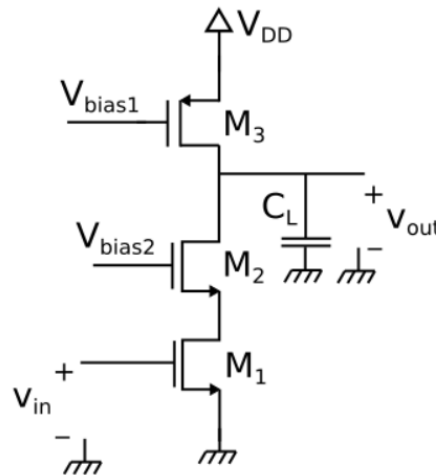


- a) 5.5MHz.
- b) 7.8MHz.
- c) 3.9MHz.
- d) 5MHz.

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

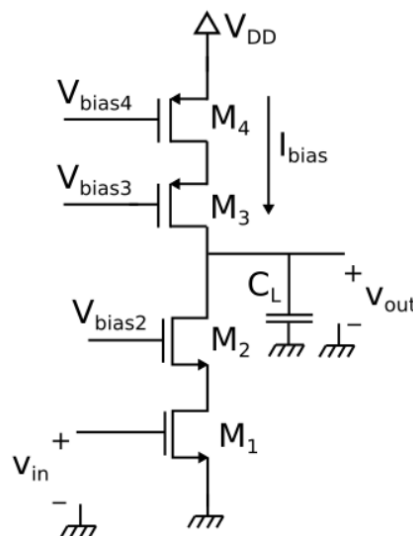
- a) Folded-cascode OTA.
- b) Telescopic OTA.
- c) Symmetric OTA.
- d) Miller OTA.

8. Given the following circuit, what is the gain  $v_{out}/v_{in}$ ? Assume that all the transistors are working in saturation.



- a)  $-gm_1 (r_{ds3} || (r_{ds1}r_{ds2}gm_2))$
- b)  $gm_1 (r_{ds3} || (r_{ds1}r_{ds2}gm_2))$
- c)  $-gm_1 (r_{ds3} || (r_{ds1}r_{ds2}gm_1))$
- d)  $gm_1 (r_{ds3} || (r_{ds1}r_{ds2}gm_1))$

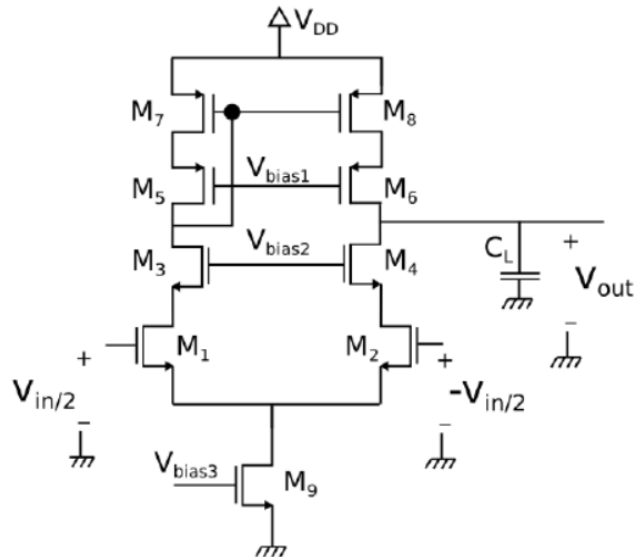
9. Given the following circuit, what is the aspect ratio (W/L) of M1 required to get a gain-bandwidth product (GBW) equal to 50 MHz? Assume that all the transistors are working in saturation, have a length L of 50 nm and  $I_{bias} = 100 \mu A$ .



Data:  $\mu_p C_{ox} = 20 \mu A/V^2$ ,  $\mu_n C_{ox} = 60 \mu A/V^2$ ,  $V_{thp} = -0.7 V$ ,  $V_{thn} = 0.7 V$ ,  $C_L = 3 pF$ .

- 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.