

Lecture #15Biasing  $T^{VDD}$ for  $M_1$ ,  $V_{DS} = V_{DS}$ 

$$I_{in} = \frac{\mu_{ox}}{2} \left( \frac{W}{L} \right)_1 (V_{GS} - V_{th})^2 (1 + x V_{OS1})$$

$$\left( \frac{W}{L} \right)_1 = \frac{I_{out}}{V_{DS2}} + \frac{V_{DS}}{V_{DS2}}$$

$$\text{for } M_2: \quad V_{DS2} > V_{DS2} - V_{th} = V_{GS1} - V_{th}$$

$$I_{out} = N \times I_{in}$$

$$V_{DS2} = V_{DS2} = V_{DS}$$

$$\left( \frac{W}{L} \right)_2 = N \left( \frac{W}{L} \right)_1$$

$$V_{DS2} - V_{th} < V_{DS} < V_{DS2} \quad \underbrace{V_{DS} = V_{DS2}}$$

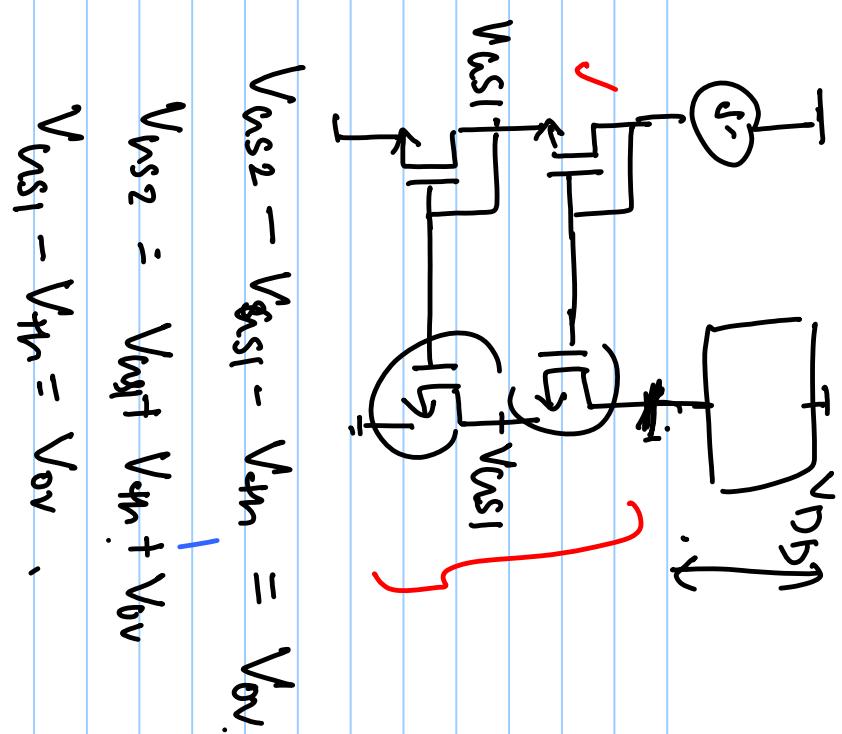
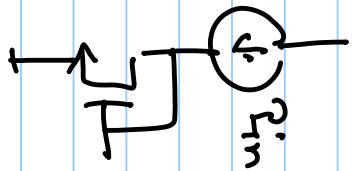
$$N \times \frac{W}{L} \times \mu_{ox} \times V_{DS2}$$

$$= 1 \times N \times \left( \frac{W}{L} \right)_1$$

$$= N \times 1 \times \left( \frac{W}{L} \right)_1$$

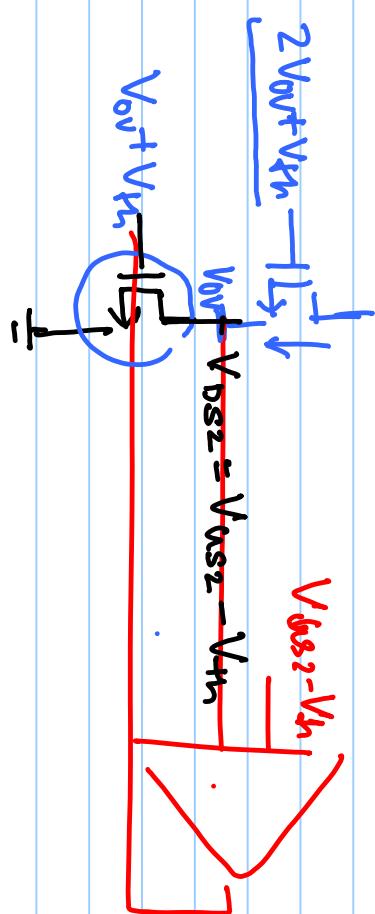
- Compliance range of current source  
- Matching b/w bias & actual current source.

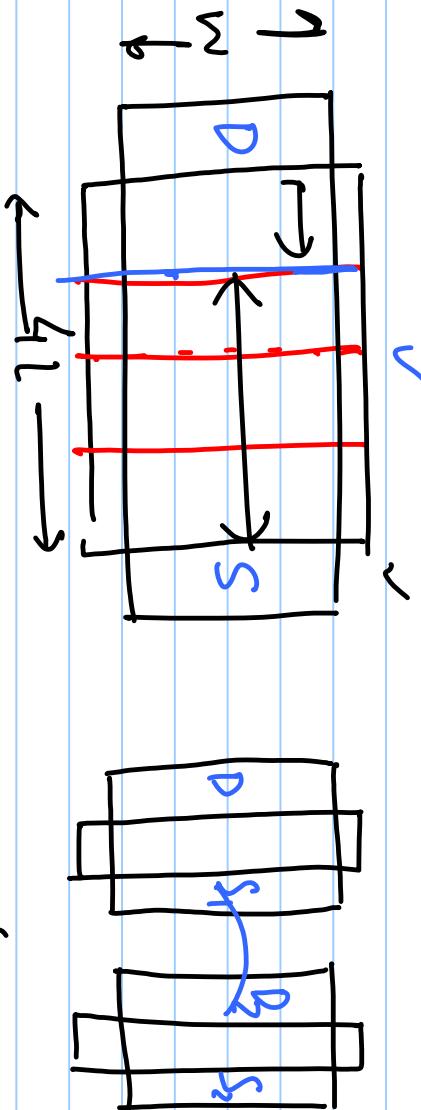
- Compliance range of current



$$I = \frac{\mu C_{ox}}{2} \left( \frac{W}{L} \right) \frac{V_{DS2} - V_{DS1}}{(2V_{in})^2}$$

$$V_{out} = V_{DS2} - V_{th}$$



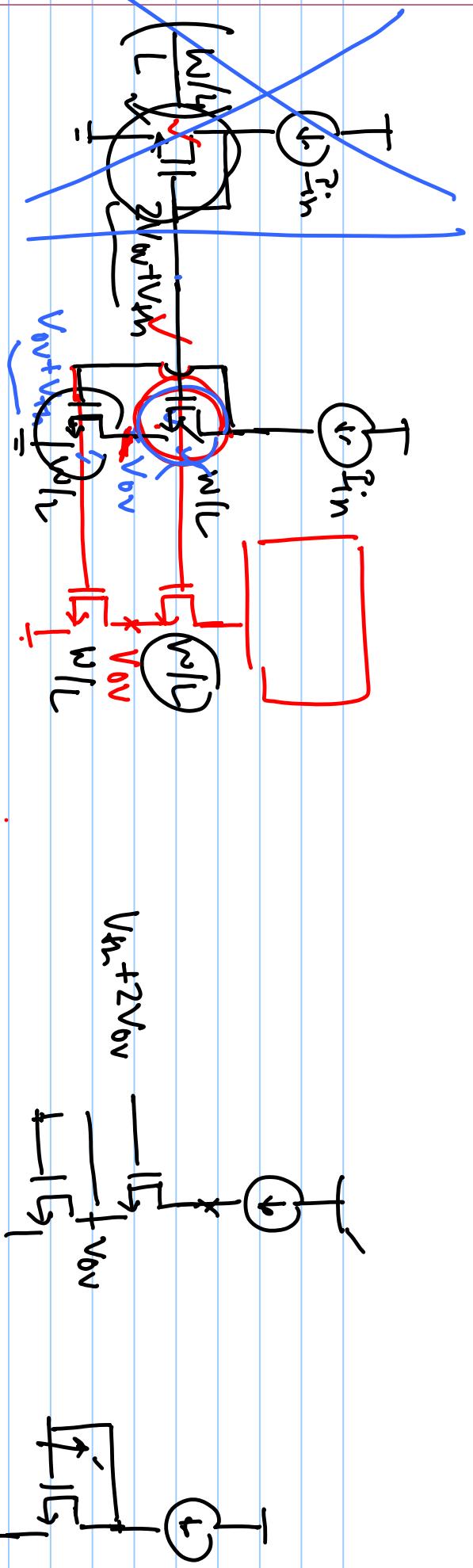


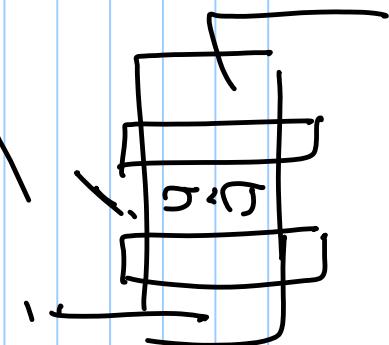
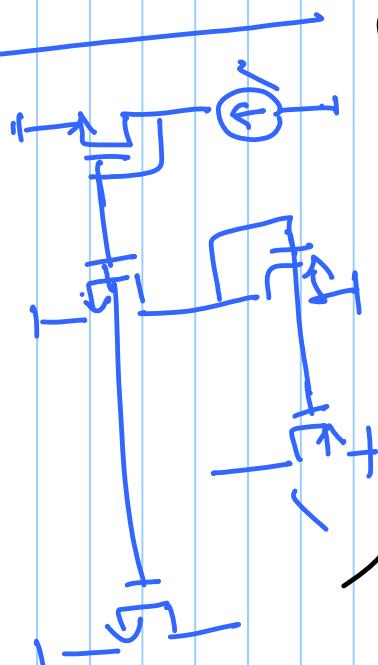
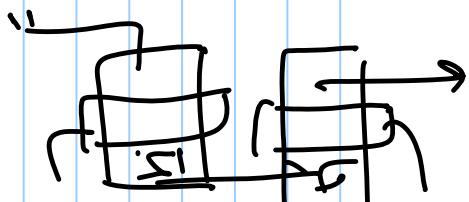
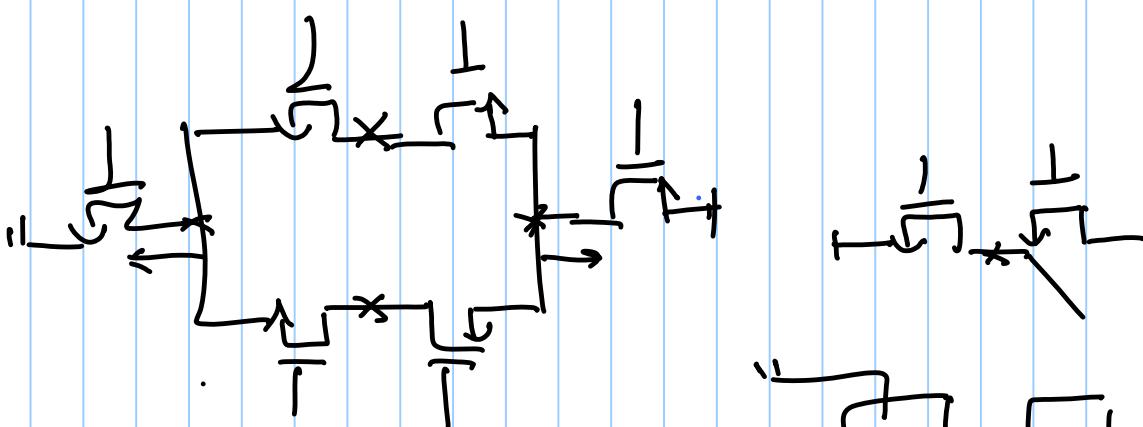
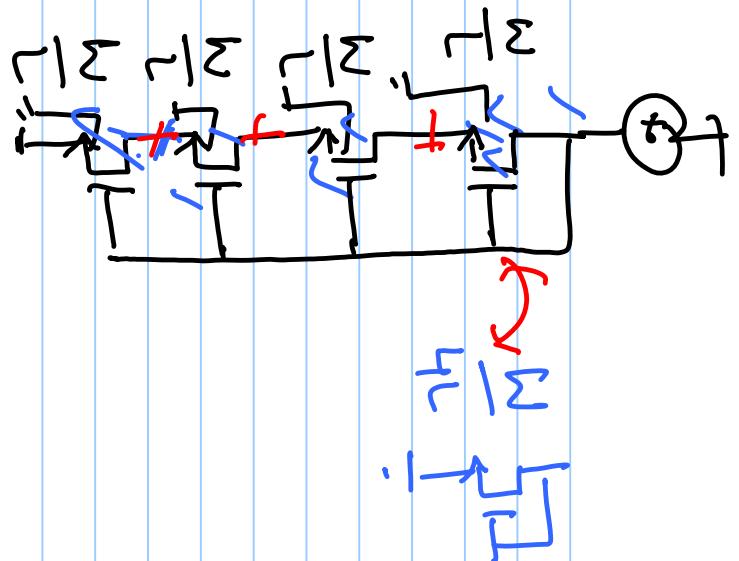
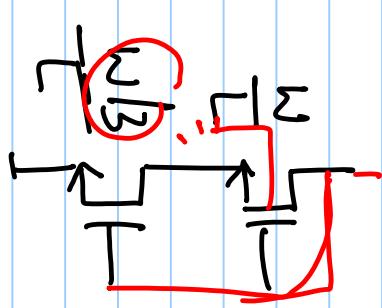
$$\frac{W/L}{L} = \frac{\omega}{4L} \sqrt{1}$$

$$(V_{out} + V_m - V_{av}) > V_{av} \quad \checkmark$$

$\checkmark$

$$V_m > V_{av}$$





$$g_{\mu\nu} = \frac{1}{r}$$