

Prob. #1

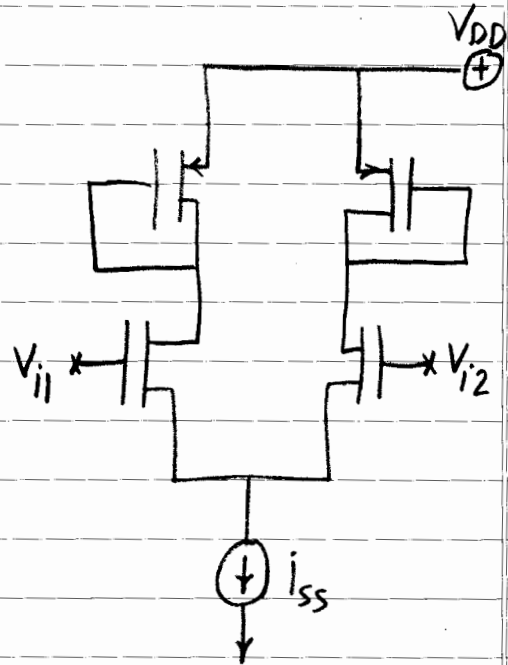
for the circuit shown, calculate the voltage gain. where

$$V_{A_n} = |V_{A_p}| = 15V$$

$$I_1 = 50 \mu A$$

$$g_{m1} = g_{m2} = 0.5 \text{ mA/V}$$

$$g_{m3} = g_{m4} = 0.6 \text{ mA/V}$$



Prob. #2

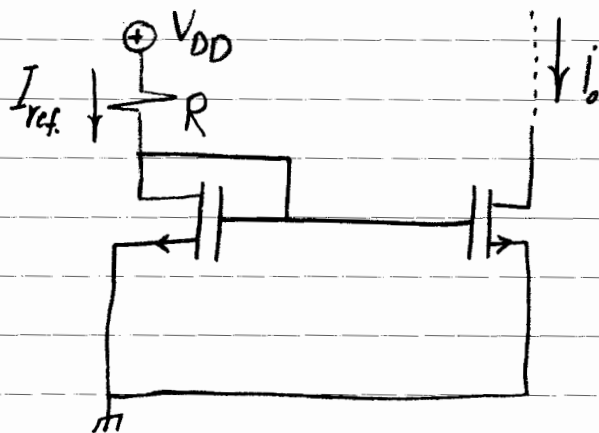
Design a current mirror, where

$$I_o = 100 \mu A$$

$$V_{DD} = 3V$$

$$L = 1 \mu m$$

$$W = 10 \mu m$$



$V_{t_n} = 0.7V$ $K_n = 200 \mu A/V^2$. Then calculate R_{out} if $V_{A_n} = 10V$

Prob. #3

Design a cascode current source

$$I_{ref} = 100 \mu A$$

$$R_{out} = 500 k\Omega$$

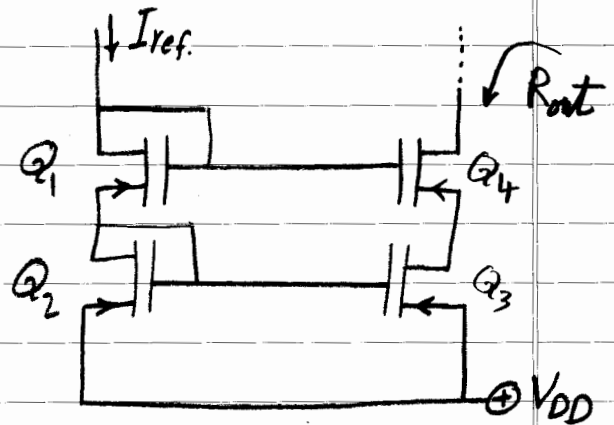
$$V_{DD} = 1.8V$$

$$V_{tp} = -0.5V$$

$$K_p = 90 \mu A/V^2$$

$$V_{Ap} = -5/Mm$$

$$|V_{ov}| = 0.3V$$



Prob. #4

a cascode amplifier with a cascode current source load.
calculate:

where R_{on} , R_{op} , and A_v

$$I_1 = 100 \mu A$$

$$V_{An} = 15V \quad |V_{Ap}| = 5V$$

$$K_n = 200 \mu A/V^2$$

$$K_p = 50 \mu A/V^2$$

