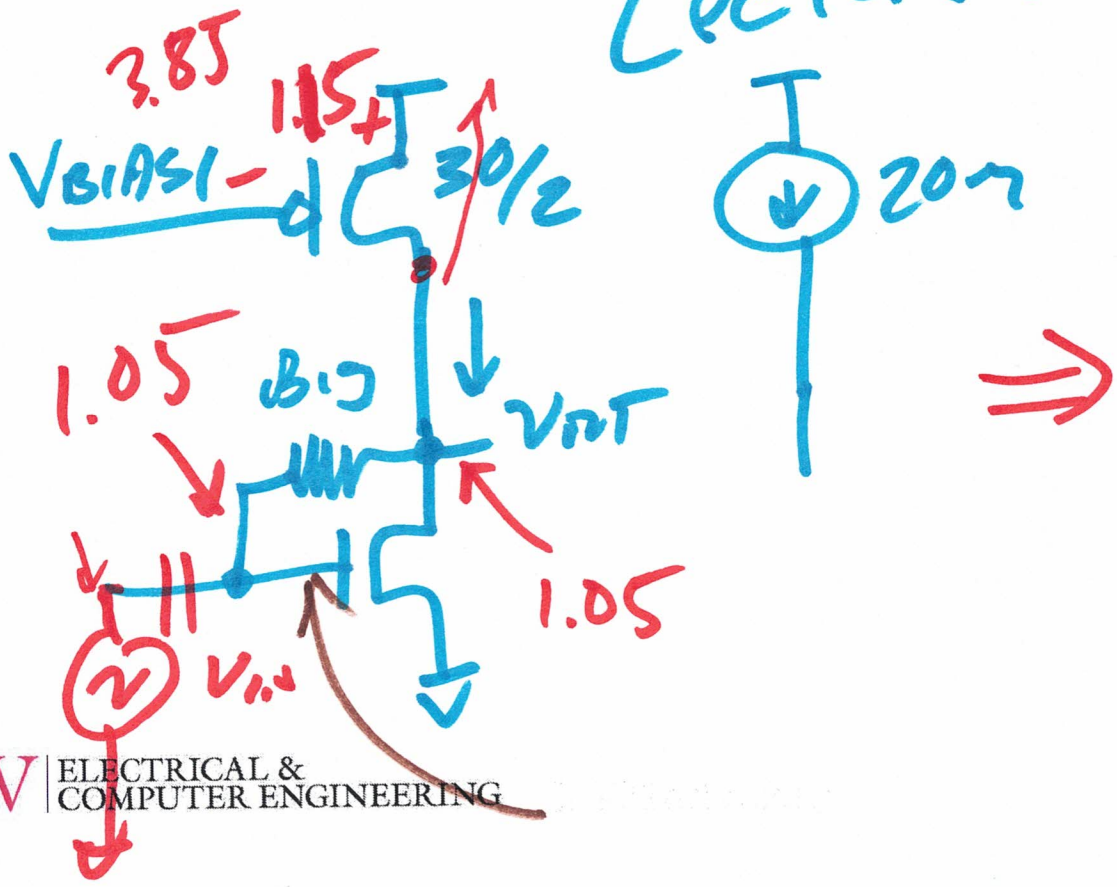
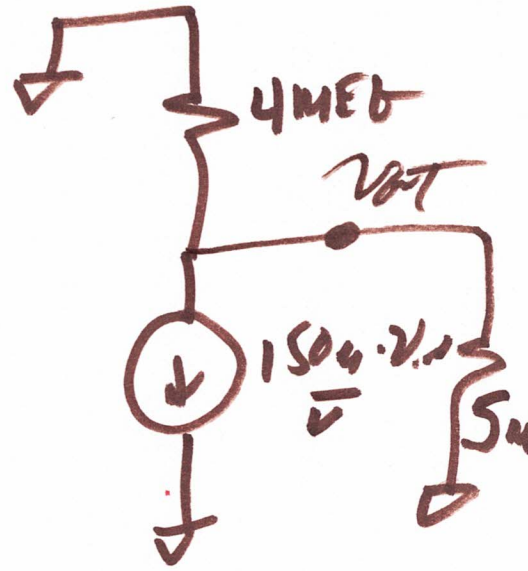
EE 420 / ECE 620
Analog IC Design
March 4, 2020
Lecture 12





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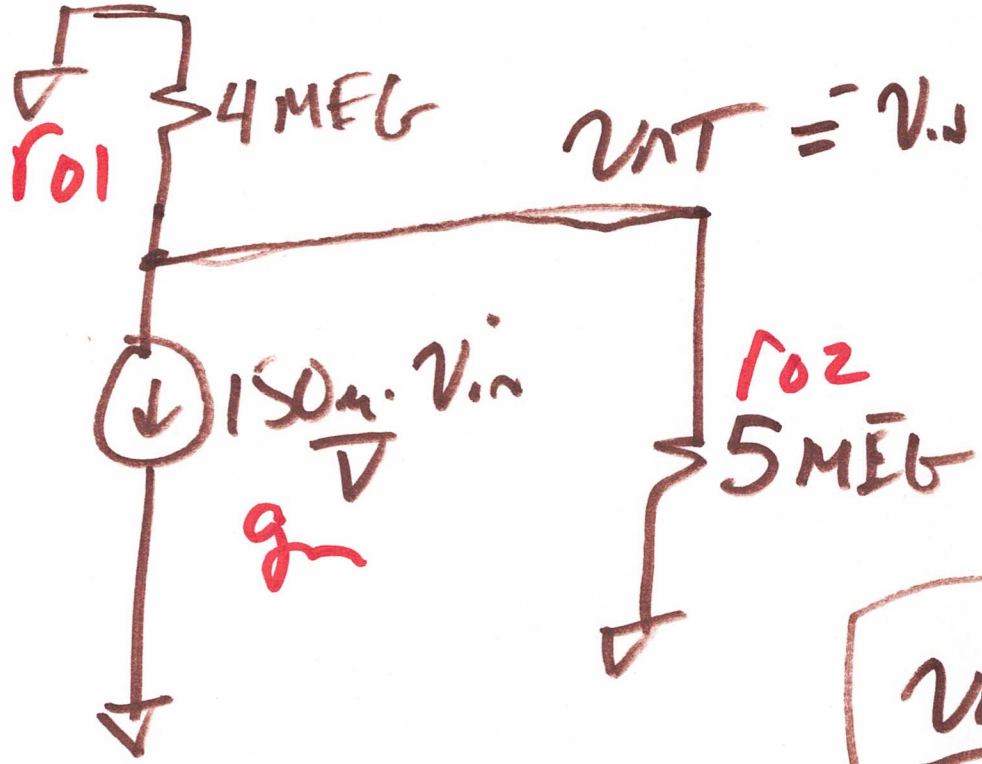


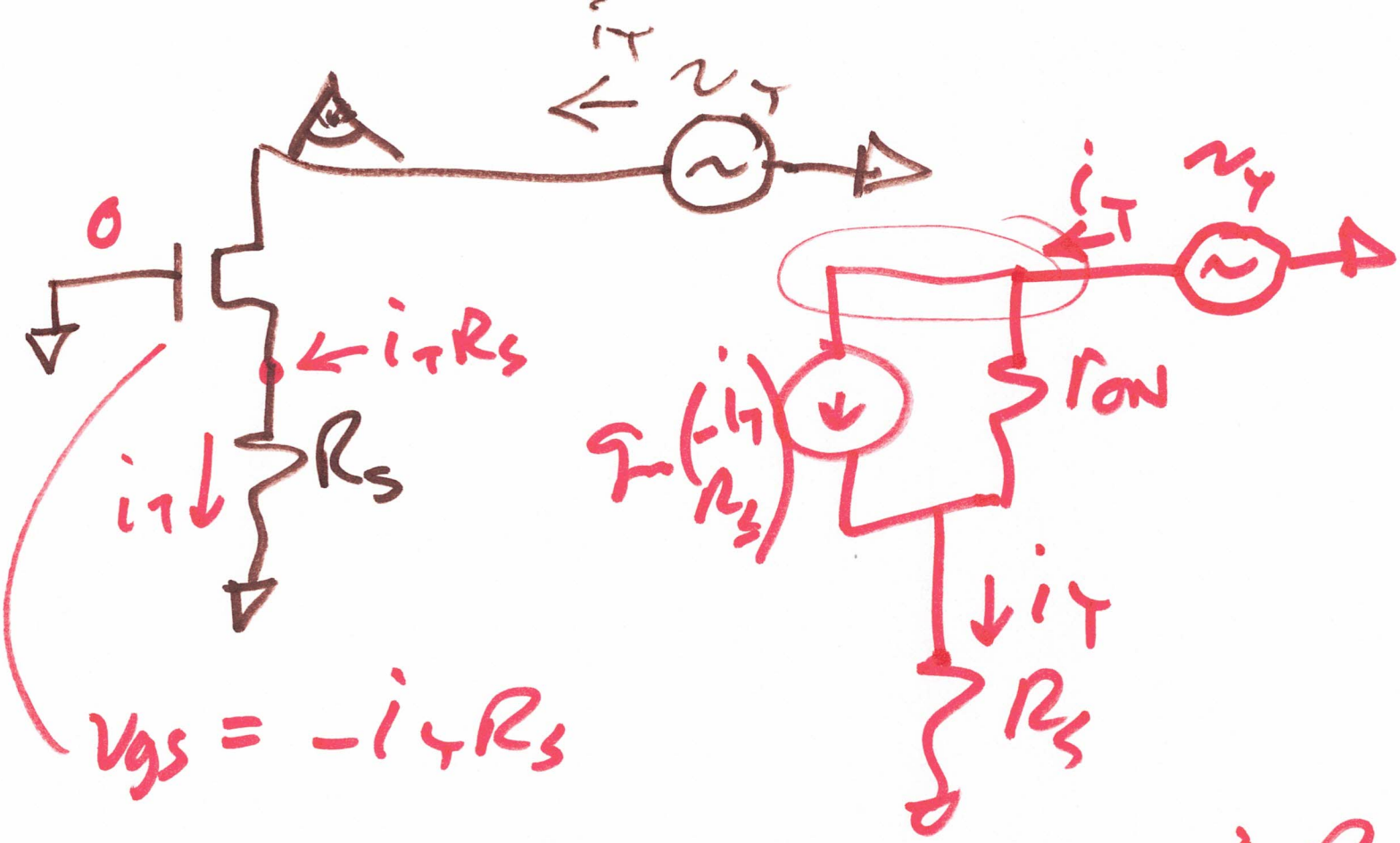
$$v_{out} = -v_{in} \cdot \frac{150\mu}{V} \cdot 5 \| 4 \text{ MEG}$$

2.2 MEG

$$\frac{v_{out}}{v_{in}} = -333.3 \frac{V}{V}$$

$$\frac{v_{out}}{v_{in}} = -g_m \, r_{o1} \| r_{o2}$$

$$-r_{o1} \| r_{o2} \Big/ \frac{1}{g_m}$$



$$i_T = g_m(-i_T R_S) + \frac{v_T - i_T R_S}{r_{ON}}$$

$$i_T(r_{ON} + g_m R_S r_{ON} + R_S) = v_T$$

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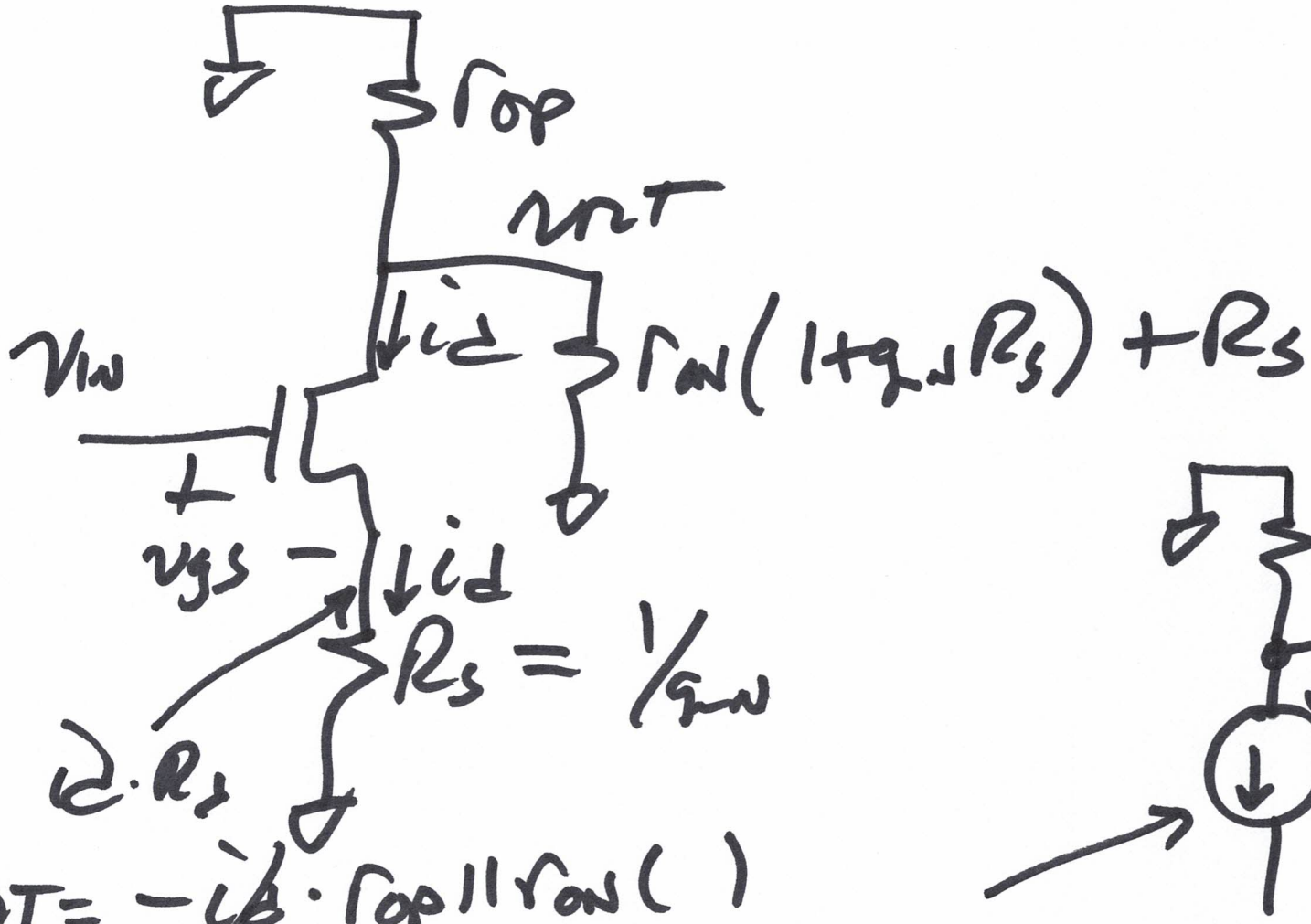
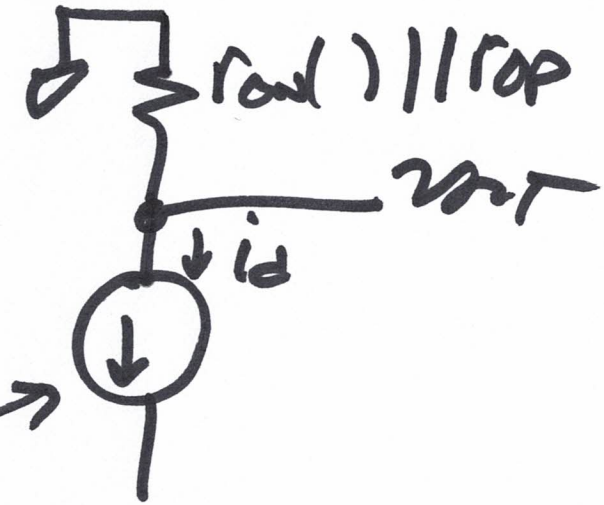
3)

$$\frac{v_T}{i_T} = r_{ON}(1 + g_m R_S) + R_S$$





$$\frac{v_{out}}{v_{in}} = \frac{-i_d \cdot r_{op} \| r_{on}()}{i_d\left(\frac{1}{g_{mn}} + R_s\right)}$$

$$g_{mn}(v_{in} - i_d \cdot R_s) = i_d$$

$$v_{in} = i_d\left(\frac{1}{g_{mn}} + R_s\right)$$

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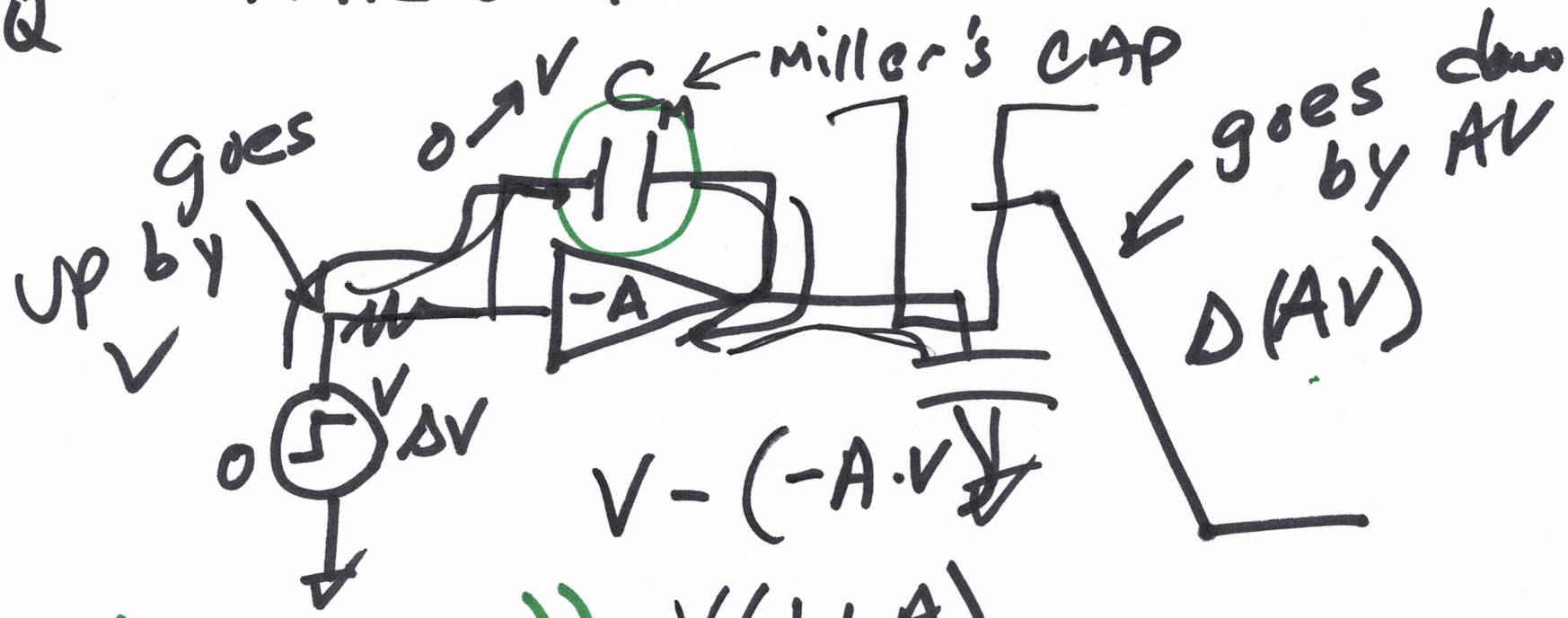
4)

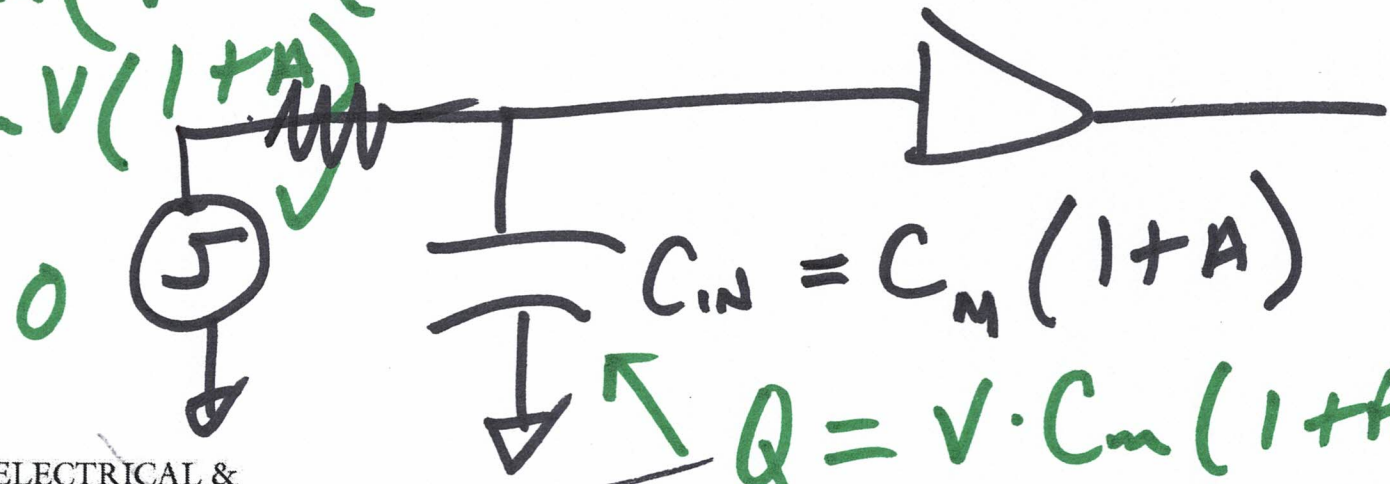
Miller's Theorem

$CV = Q$



$Q = C_M(V - (-AV))$

$= C_M V(1+A)$



$Q = V \cdot C_M(1+A)$

RC

5)

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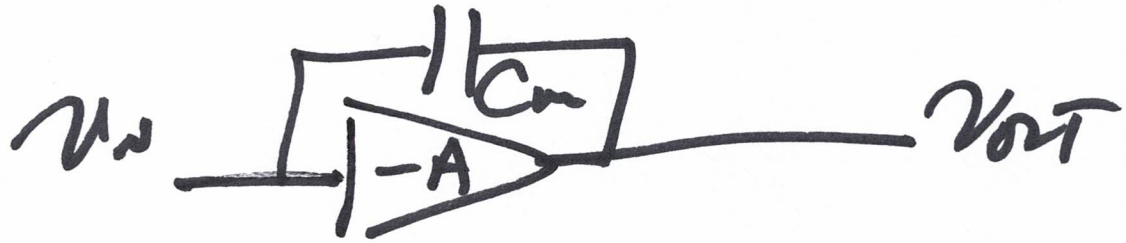
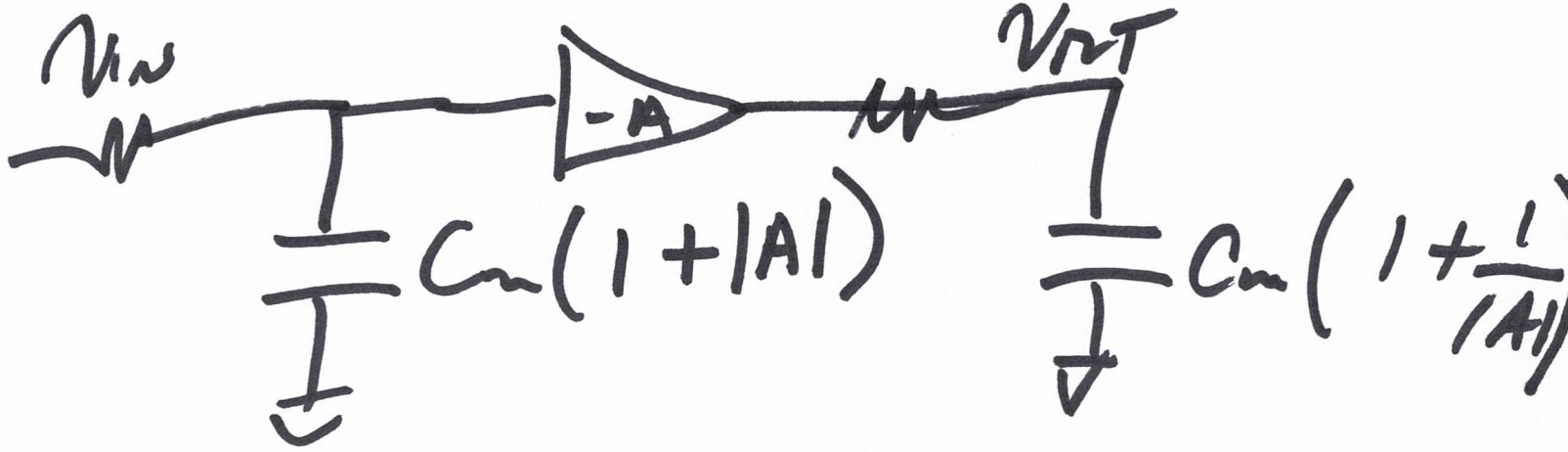
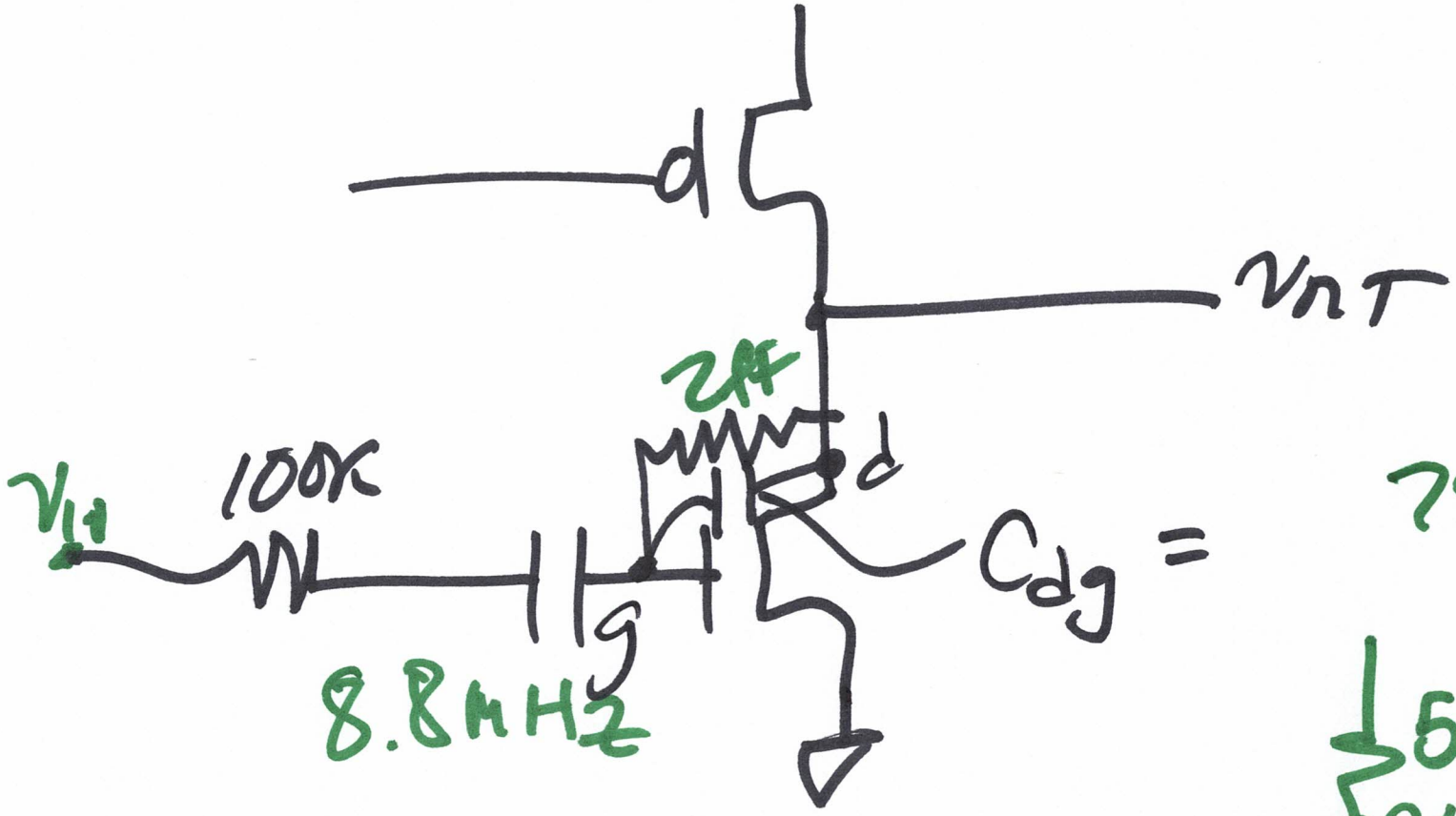
Millers Theorem





b)



$$f_{3dB} = \frac{1}{2\pi \cdot 10^5 \cdot 182ff}$$

2ff(1+90)
≃180ff