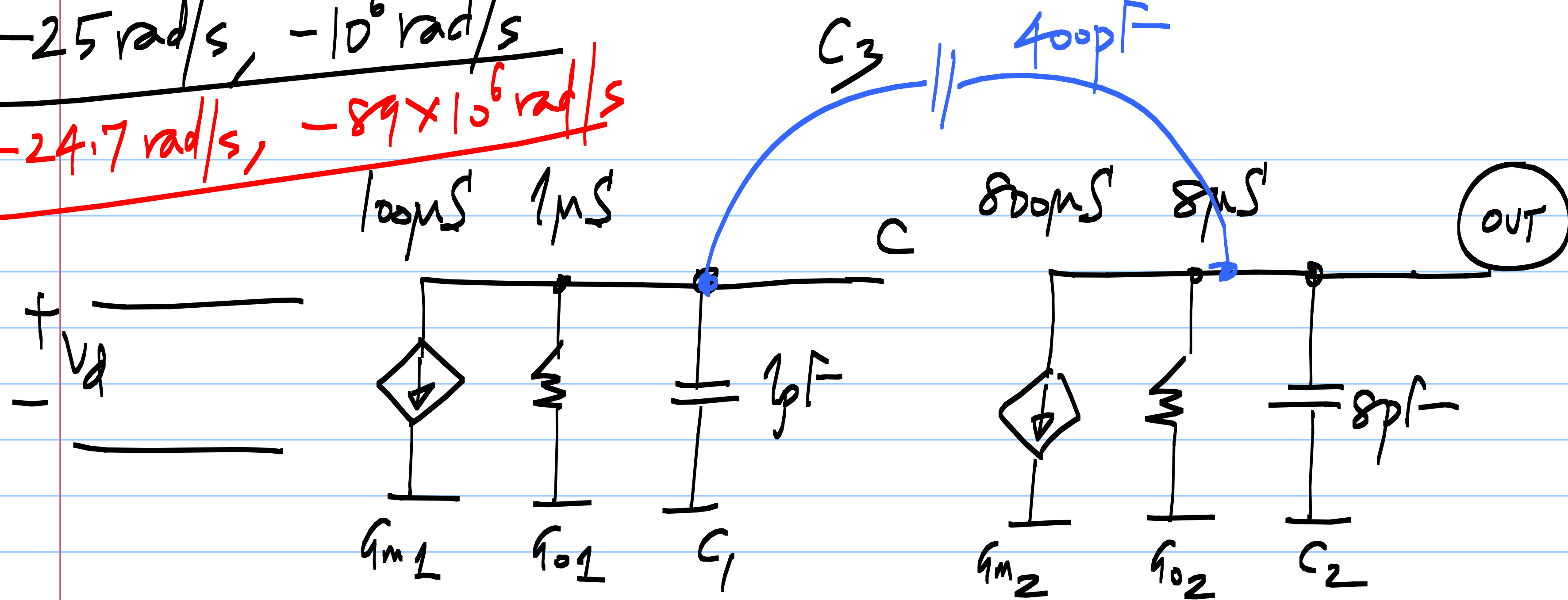
~~$-25\ rad/s,\ -10^6\ rad/s$~~

~~$-24.7\ rad/s,\ -89\times10^6\ rad/s$~~



$$\frac{V_o(s)}{V_d(s)} = \frac{G_{m_1}\left(G_{m_2} - sC_3\right)}{s^2\left(C_1C_2 + C_2C_3 + C_3C_1\right) + s\left[C_1G_{o_2} + C_2G_{o_1} + C_3\left(G_{m_2} + G_{o_2} + G_{o_1}\right)\right] + G_{o_1}G_{o_2}}$$

$$\boxed{as^2+bs+c=0}$$

$$s = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$a = C_1C_2 + C_2C_3 + C_3C_1$$

$$b = C_1G_{02} + C_2G_{01} + C_3(G_{m_2} + G_{02} + G_1)$$

$$c = G_{01}G_{02}$$

$$p_1 \simeq \frac{-G_{01}G_{02}}{C_3(G_{m_2} + G_{02} + G_{01}) + C_1G_{02} + C_2G_{01}}$$

$$p_2 \simeq \frac{C_3(G_{m_3} + G_{02} + G_{01}) + C_1G_{02} + C_2G_{01}}{C_1C_2 + C_2C_3 + C_3C_1}$$

$$bs + c = 0$$

$$s \simeq -\frac{c}{b}$$

$$as^2 + bs = 0$$

$$s \simeq -\frac{b}{a}$$

with C_3 | without C_3

p_1 $\quad \dfrac{G_{o1}}{C_3\left(\frac{G_{m_2}+1}{G_{o2}}+\frac{G_{o1}}{G_{o2}}\right)+C_1+\frac{C_2 G_{o1}}{G_{o2}}}$ $\quad$ lower frequency $\quad \dfrac{G_{o1}}{C_1}$

$\div\ C_3+C_1$

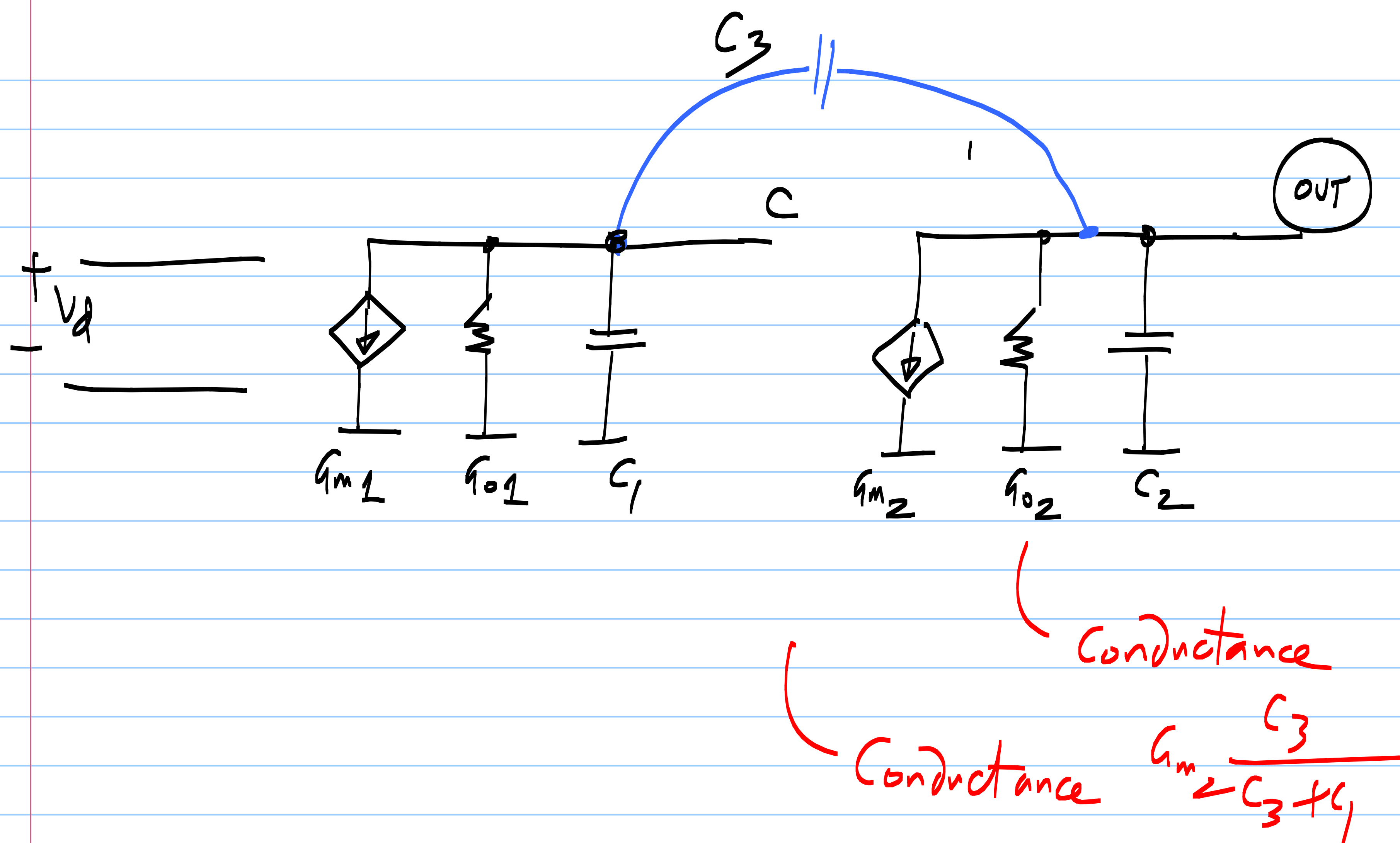
p_2 $\quad \dfrac{C_3(G_{m_2}+G_{o2}+G_{o1})+C_1 G_{o2}+C_2 G_{o1}}{C_1C_2+C_2C_3+C_3C_1}$ $\quad$ higher freq. $\quad \dfrac{G_{o2}}{C_2}$

$$\frac{G_{m_2}\cdot C_3/C_1+C_2+G_{o2}+\frac{C_3+C_2}{C_3+C_1}\cdot G_{o1}}{}$$

$\div C_3 + C_1$

$$P_2 \quad \frac{C_3(G_{m_2} + G_{o_2} + G_{o_1}) + C_1 G_{o_2} + C_2 G_{o_1}}{C_1 C_2 + C_2 C_3 + C_3 C_1} \quad \frac{G_{o_2}}{C_2}$$

$$\frac{G_{m_2} \cdot C_3 / C_1 + C_2 + G_{o_2} + \frac{C_3 + C_2}{C_3 + C_1} \cdot G_{o_1}}{C_2 + \frac{C_1 C_3}{C_1 + C_3}}$$

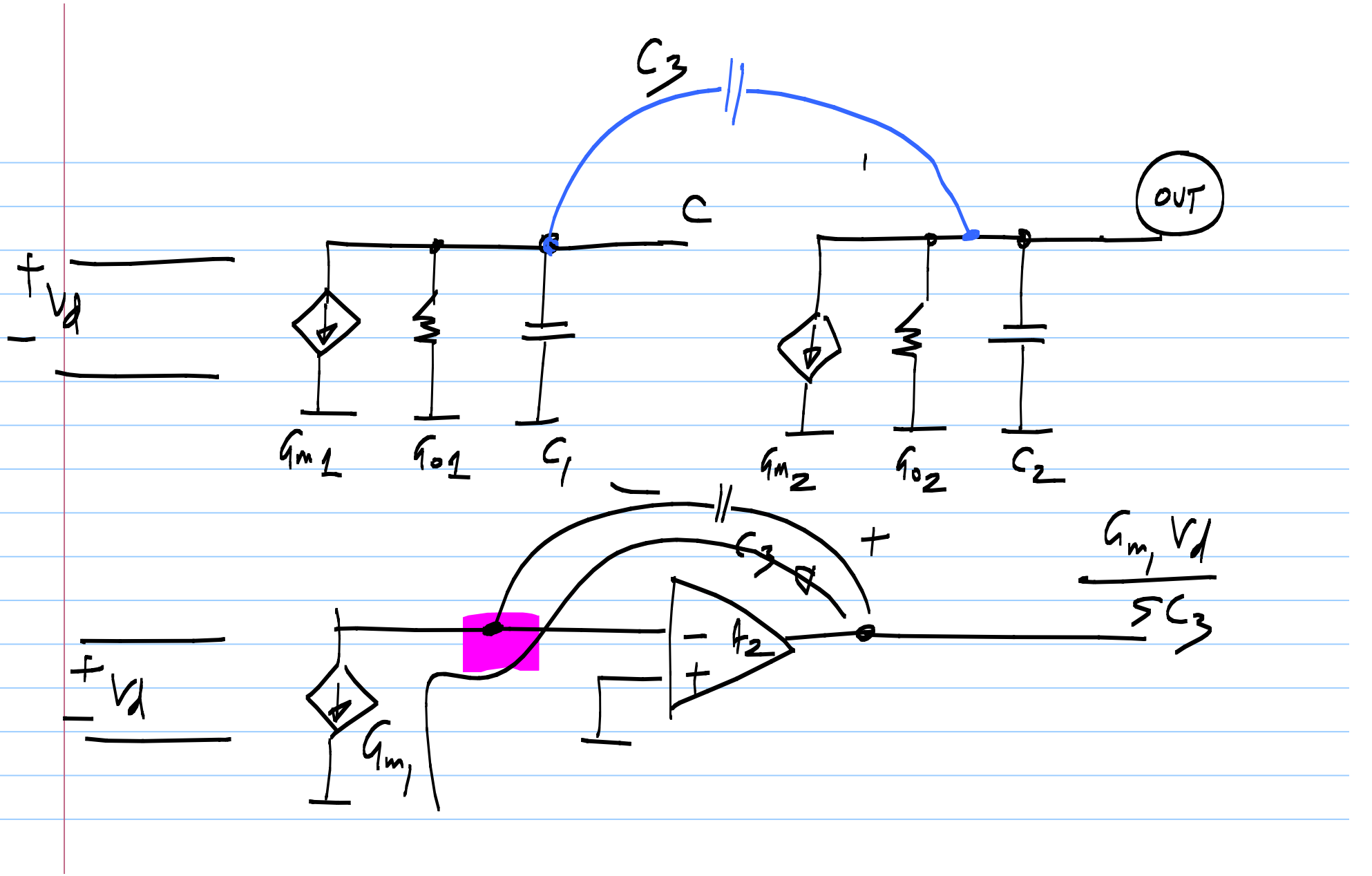


C3
C
OUT
+
Vd
−
gm1
go1
C1
gm2
go2
C2
Conductance
Conductance
$g_{m_2}\frac{C_3}{C_3+C_1}$

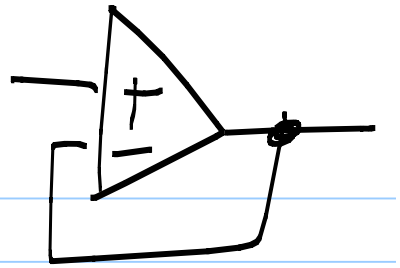
$$\omega_{upp4} = A_o \cdot |p_1|$$

$$= \frac{G_{m1} G_{m2}}{G_{o1} G_{o2}} \cdot \frac{G_{o1}}{C_3\left(\frac{G_{m2}}{G_{o2}} + 1 + \text{[illegible]}\right)}$$

$$= \frac{G_{m1}}{C_3}$$

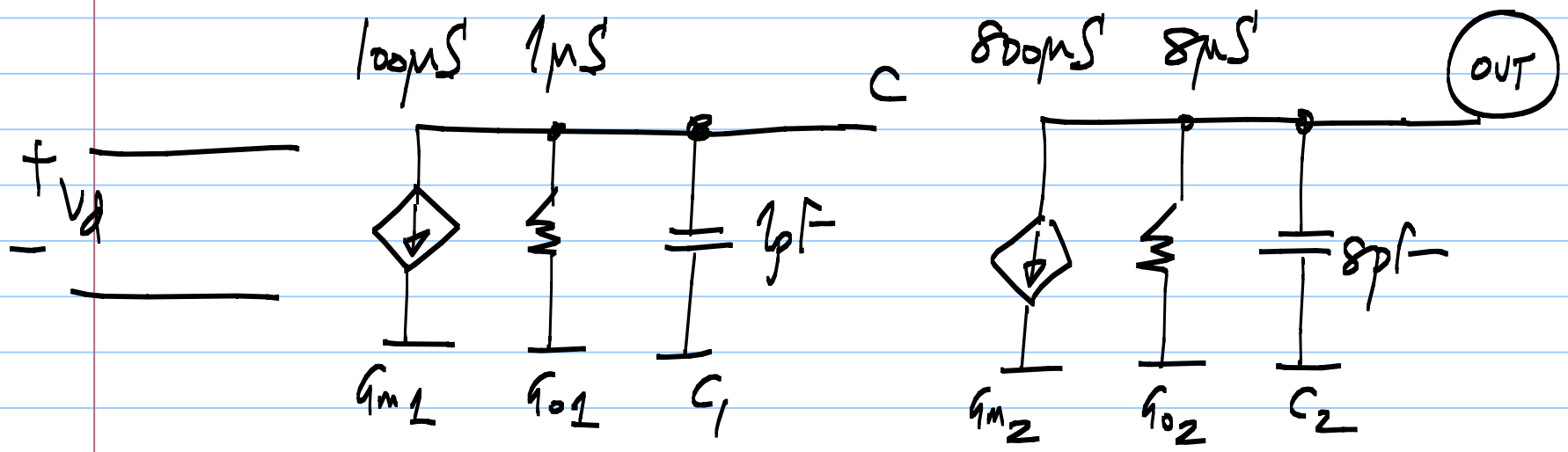

C3
C
OUT
+
Vd
−
gm1
go1
C1
gm2
go2
C2
C3
+
gm1 Vd
5C3
+
Vd
−
gm1
A2
−
+

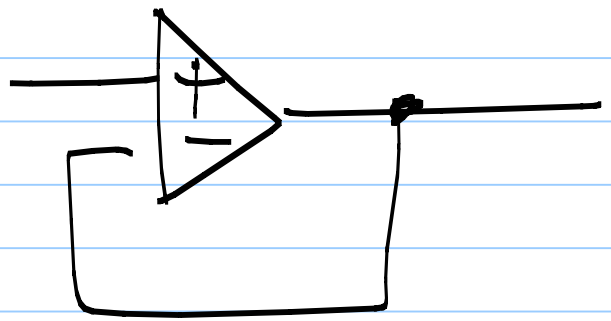
$$p_2 = 4\,\omega_{u,loop} = 4\,\omega_{u,opA}$$



$$\frac{G_{m_2}\cdot\dfrac{C_3}{C_1+C_3} + G_{o_2} + G_{o_1}(\quad)}{C_2 + \dfrac{C_1 C_3}{C_1+C_3}} = 4\cdot\frac{G_{m_1}}{C_3}$$

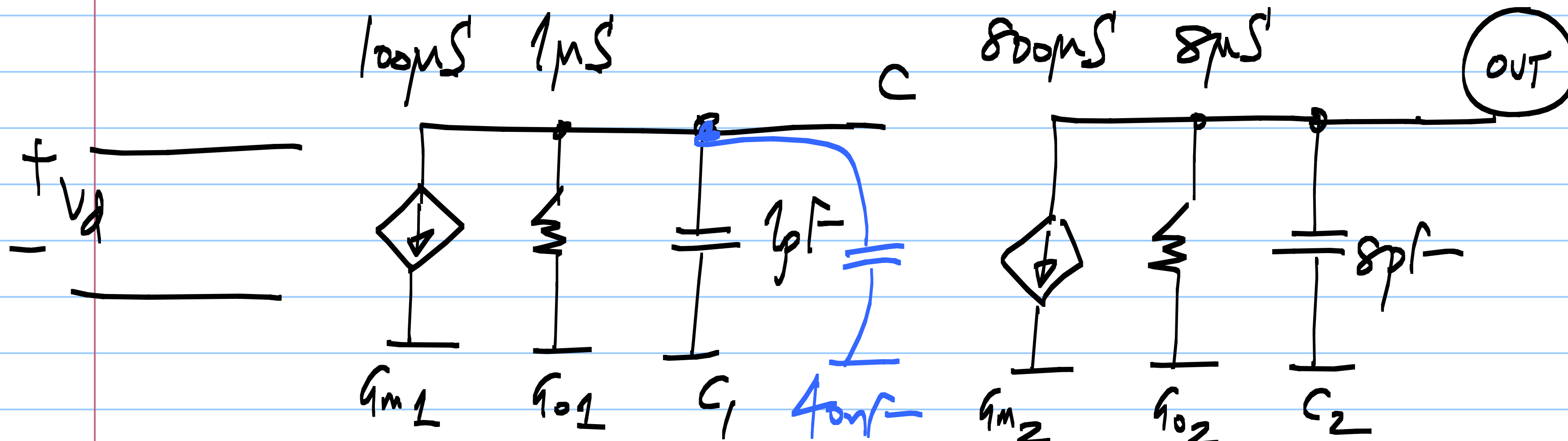
$$C_3 = 5.2\,pF \quad ; \quad \omega_{u,opA} = 19\ Mrad/s$$

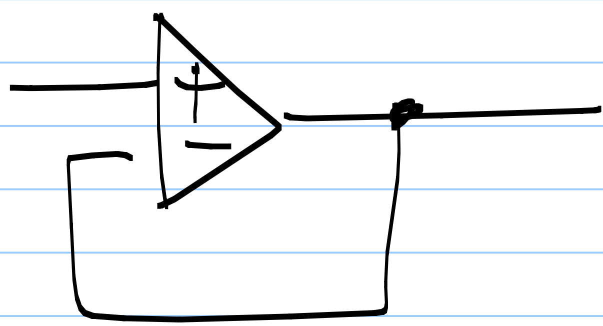




$p_1, p_2 = -1\,\text{Mrad/s}$

(poor damping factor)





$-p_1 = 25$ rad/s ; $\omega_{u,loop} =$ 250 krad/s

$-p_2 = 1$ Mrad/s