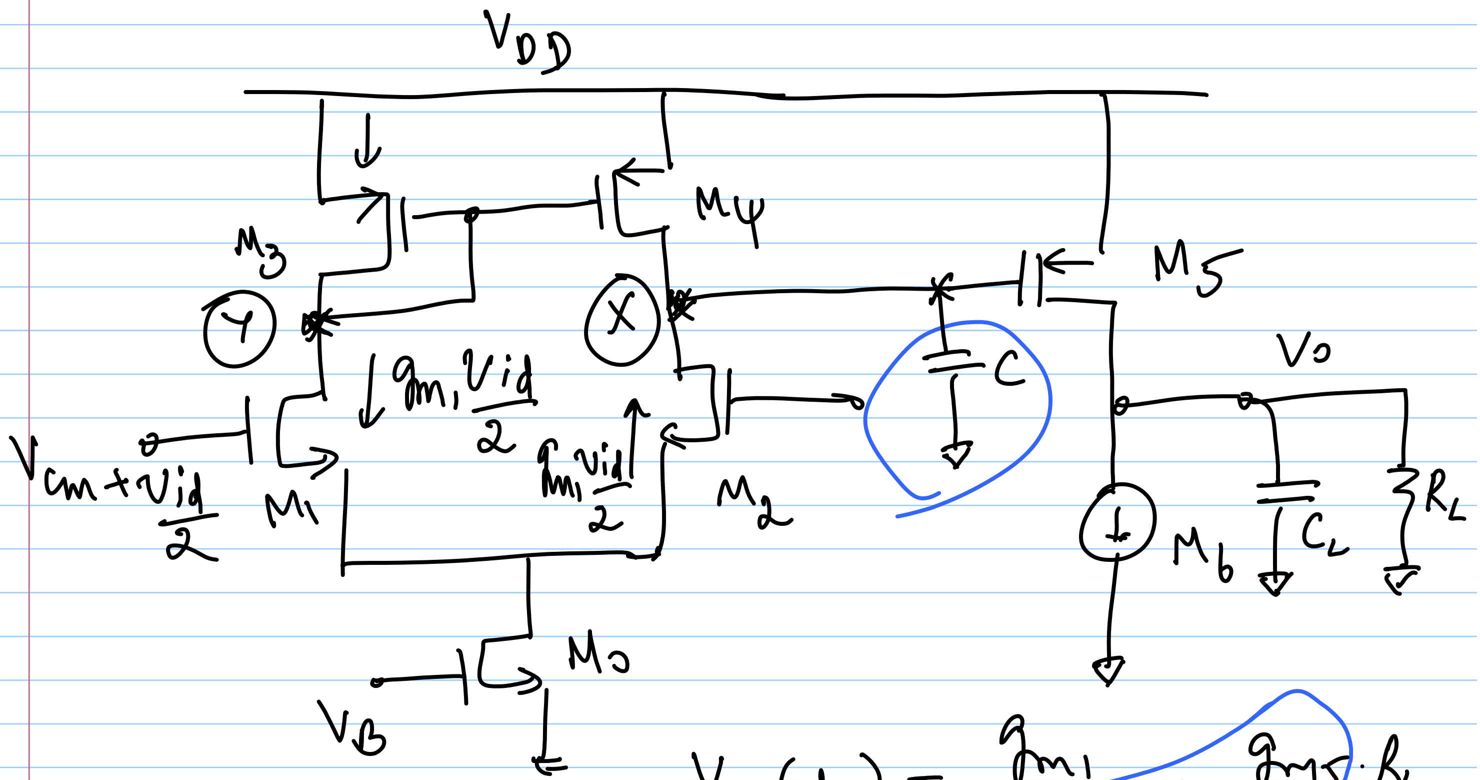
19-2-13

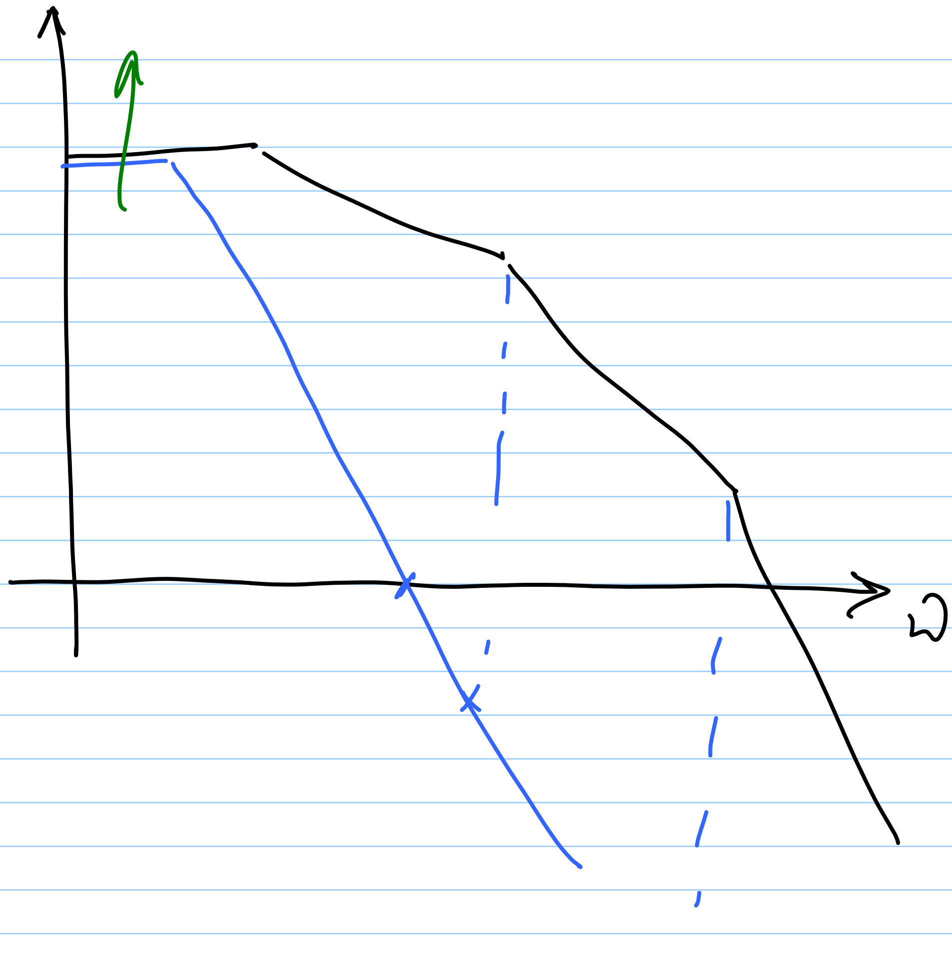
Lec 23

$V_x(dc) = V_{dd} - V_{SG_3}$



$$\frac{V_o}{V_i}(dc) = \frac{g_{m1}}{g_{ds2}+g_{ds4}} \cdot g_{m5} \cdot R_L$$

| |

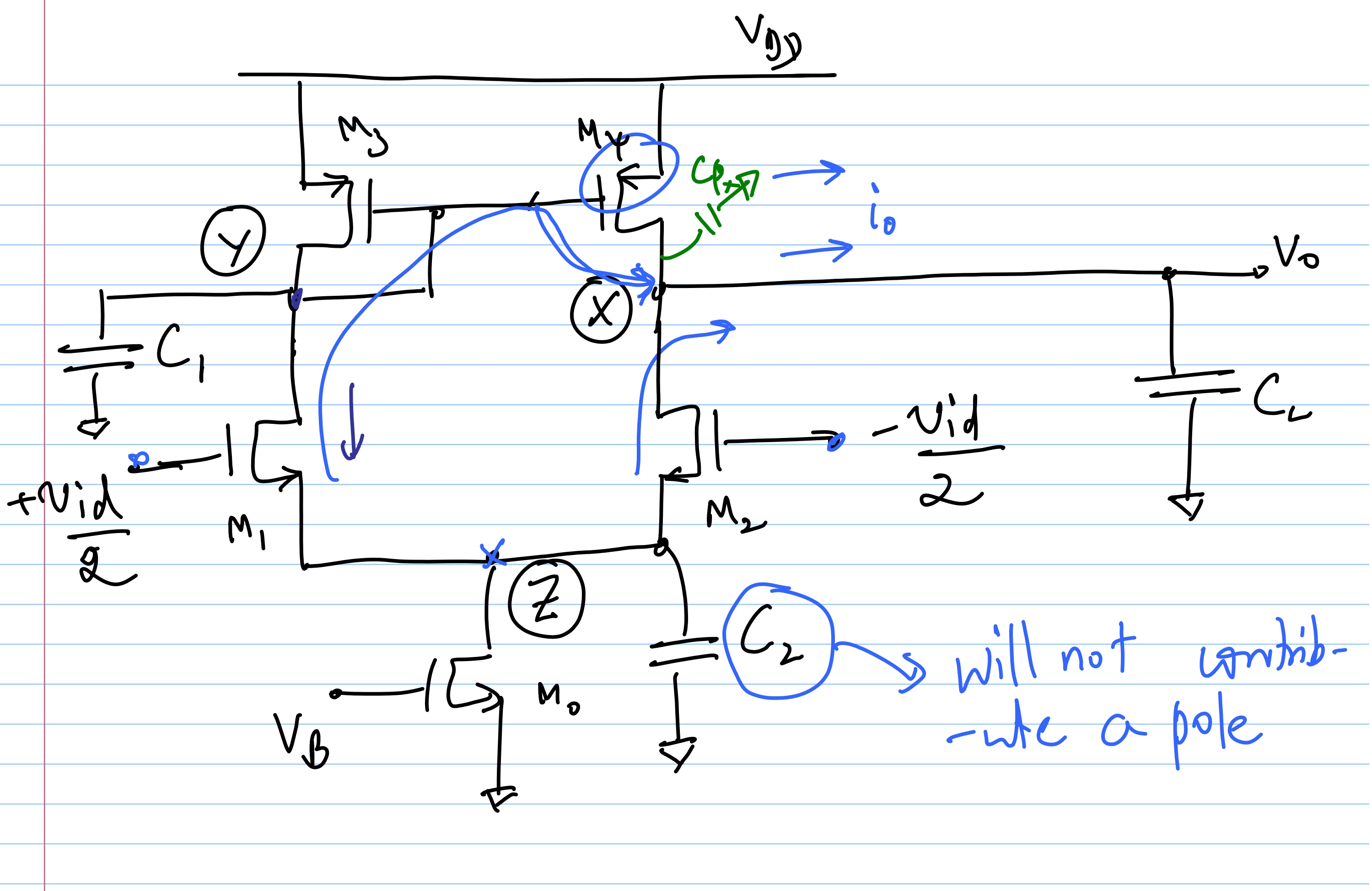


Single-stage Opamp – Datasheet

1) DC gain $= \dfrac{g_{m1}}{g_{ds_2} + g_{ds_4}}$

2) $G_m = g_{m1}$; $\omega_u = g_{m1}/C_L$ ✓

3) Non-dominant poles & zeroes

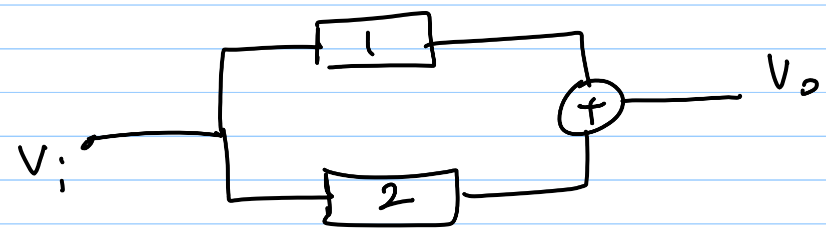


will not contribute a pole

$\underline{C_1}$

$$\text{pole} = \frac{g_{m3}}{C_1}$$

<u>zeroes</u>



a) 2 paths

b) phase shift between the two paths

$$i_{o_1} = g_{m_2} \frac{v_{id}}{2}$$

$$i_{o_2} = g_{m_1} \cdot \frac{-1}{g_{m_3} + sC_1} \times - g_{m_4} * \frac{v_{id}}{2}$$

$$v_o = (i_{o_1} + i_{o_2}) \cdot \frac{1}{g_o + sC_L}$$

$$\frac{v_o}{v_{id}} = \left[\frac{g_{m_1}}{2} + \frac{g_{m_1} \cdot g_{m3}}{2(g_{m_3} + sC_1)}\right] \cdot \frac{1}{g_o + sC_L}$$

$$\frac{v_o}{v_d} = \frac{g_{m1}}{g_o} \times \frac{\left[1 + \frac{sC_1}{2g_{m3}}\right]}{\left[1 + \frac{sC_1}{g_{m3}}\right]\left[1 + \frac{sC_L}{g_o}\right]}$$

$z_1 = 2p_1$

p_1