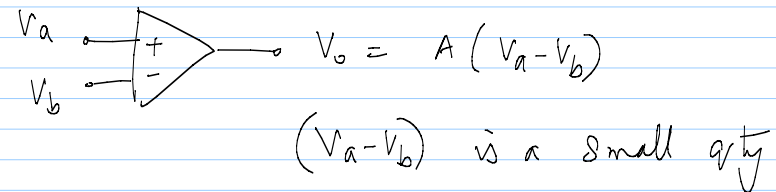


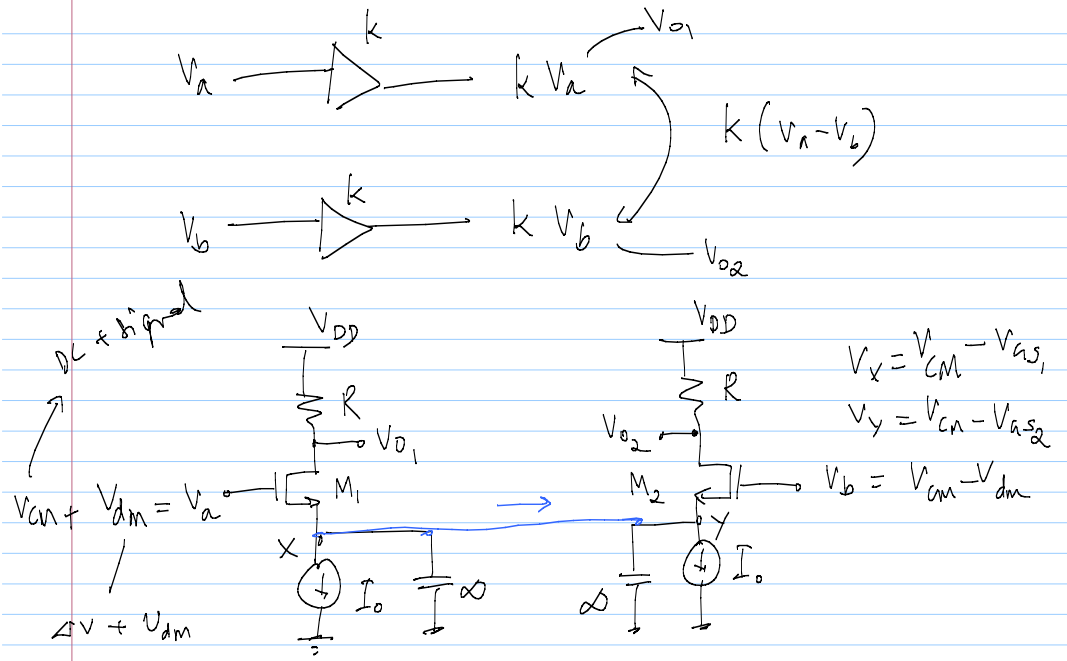
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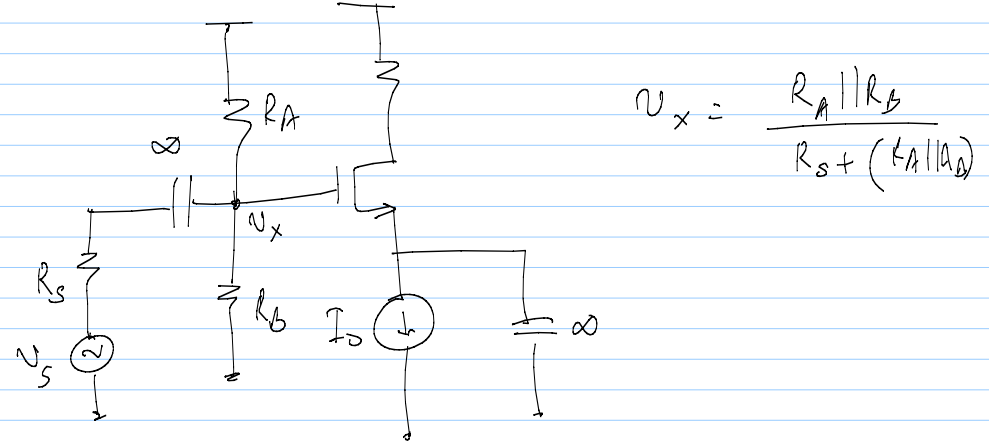


$V_a = \frac{V_a + V_b}{2} + \frac{V_a - V_b}{2}$ 
  
 $V_b = \frac{V_a + V_b}{2} - \frac{V_a - V_b}{2}$

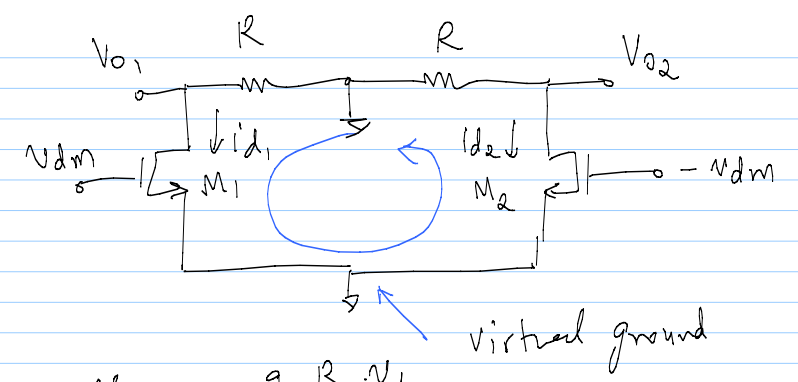
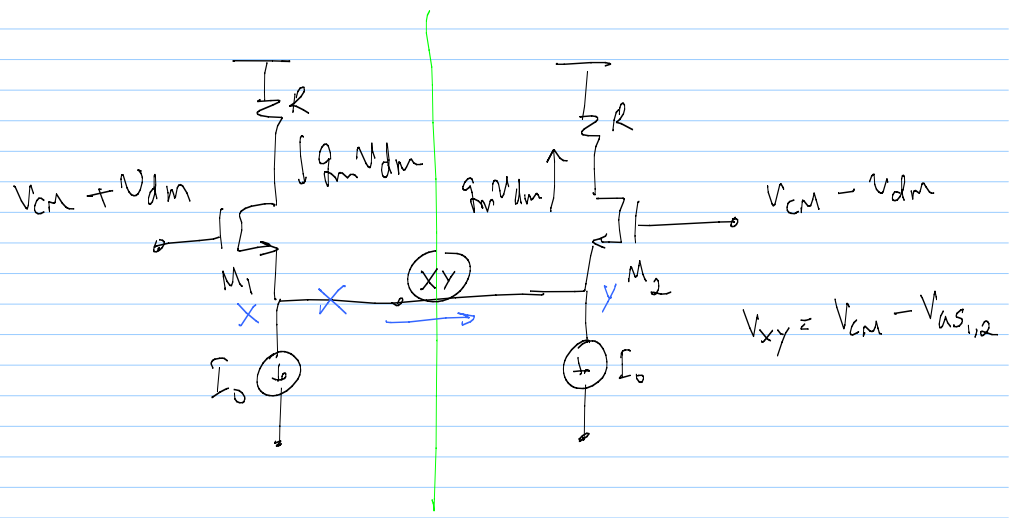
$\frac{V_a + V_b}{2}$  → CM voltage  $V_{cm}$  (avg.)  
 $\frac{V_a - V_b}{2}$  → DM voltage  $V_{dm}$



$V_{cm} = dc$   
 $V_{dm} = ac$   
 e.g.  $V_a = 3V (dc) +$   
 $V_b = 3.1V (dc)$   
 $V_{CM} = 3.05V$   
 $V_{DM} = 0.05V$



$$V_x = V_y$$

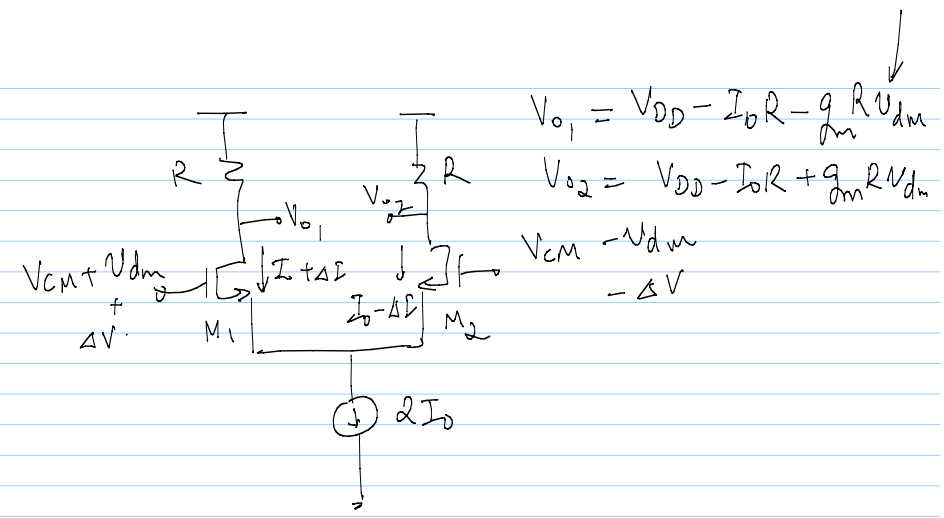
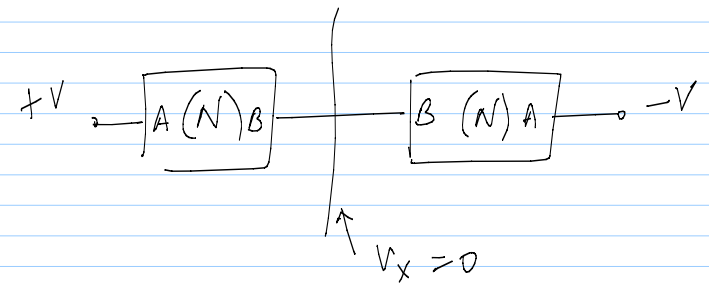
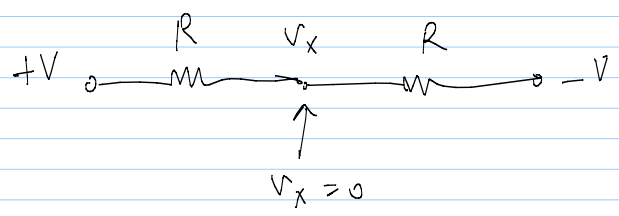


$$V_{o1} = -g_m R V_{dm}$$

$$V_{o2} = g_m R V_{dm}$$

$$i_{d1} = g_m V_{dm}$$

$$i_{d2} = -g_m V_{dm}$$



$$V_{o1} = V_{DD} - I_o R - g_m R V_{dm}$$

$$V_{o2} = V_{DD} - I_o R + g_m R V_{dm}$$