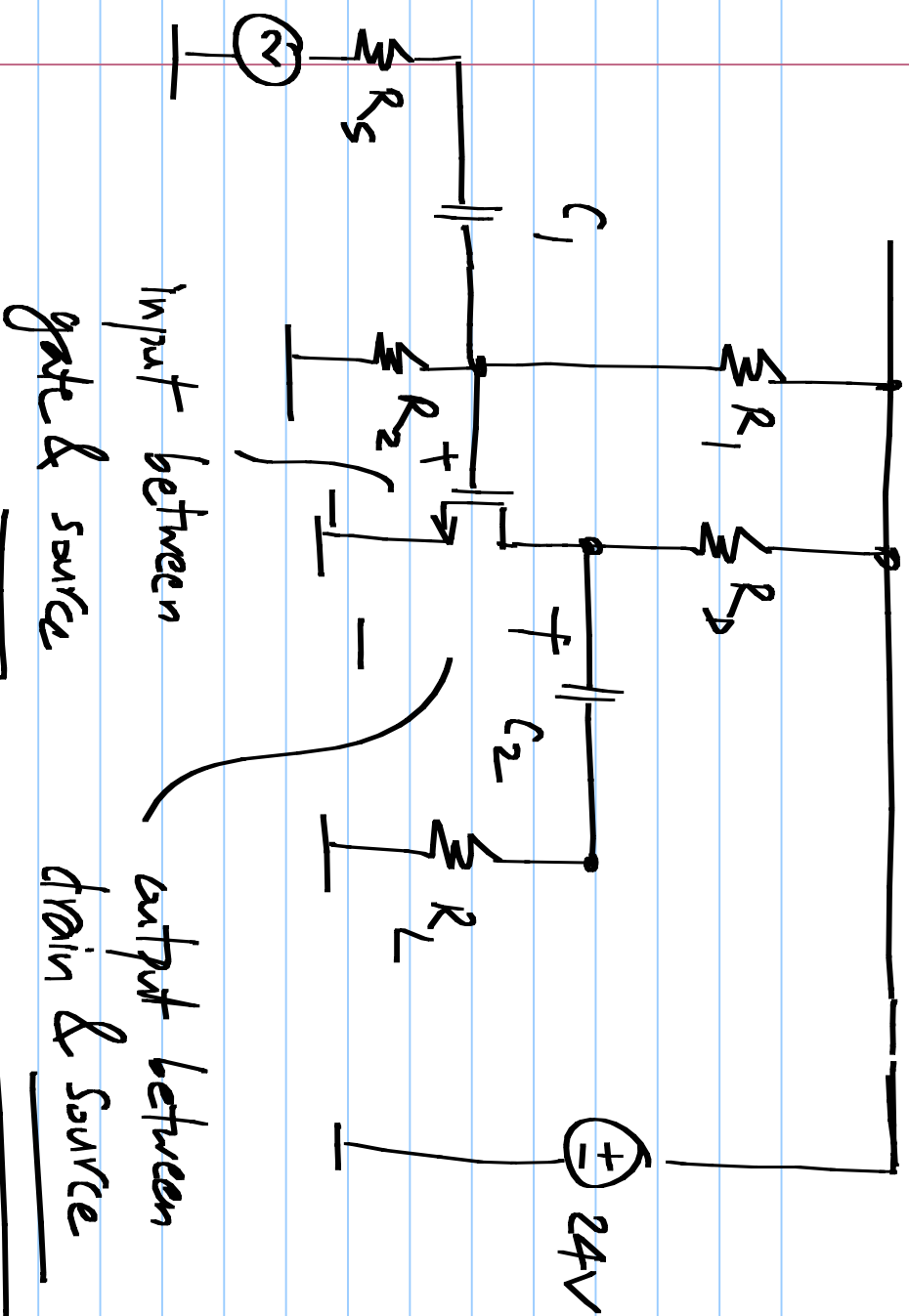
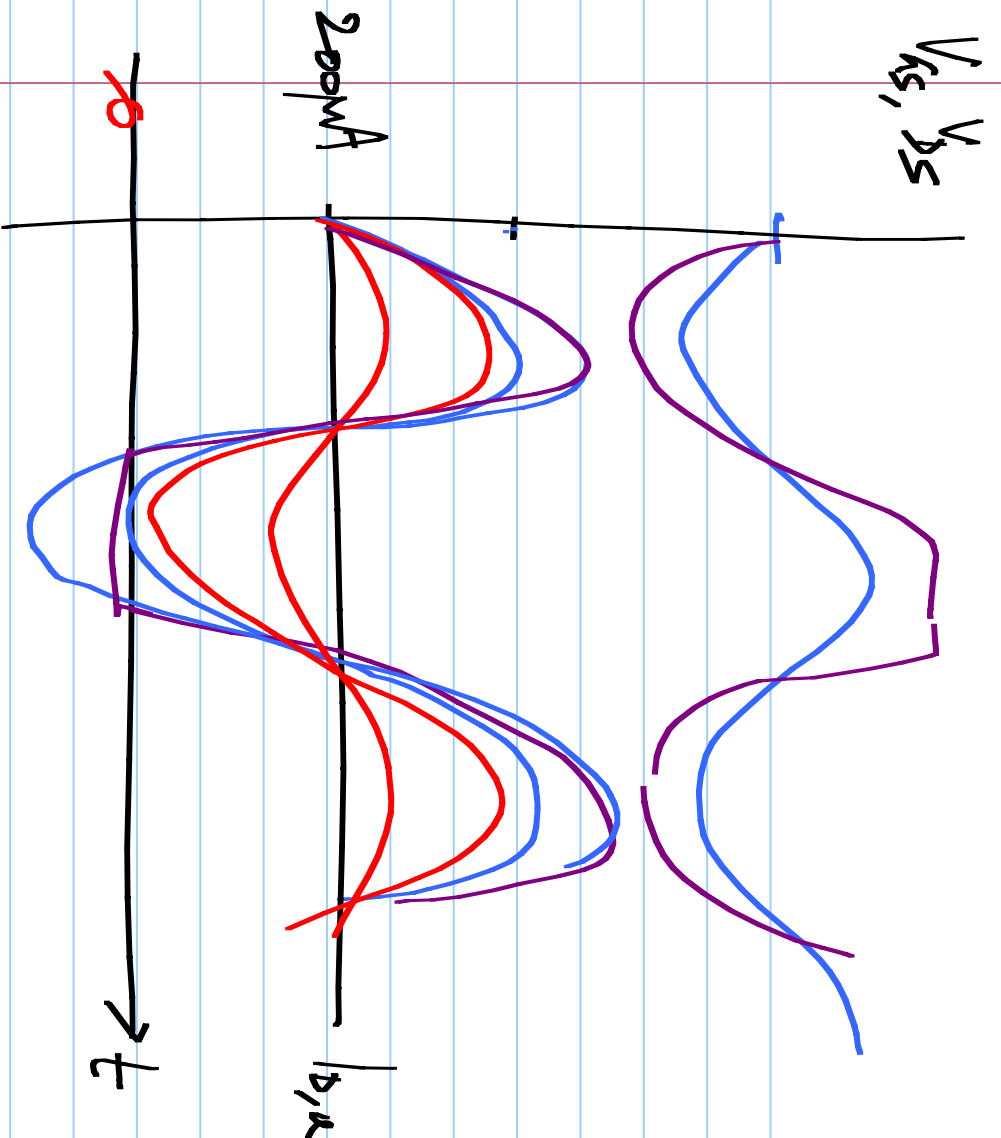




COMMON SOURCE AMPLIFIER



$$V_S = V_p \sin \omega t$$

$$V_{GS} = 3V + V_p \sin \omega t$$

$$V_{DS} = \frac{4V - 10V_p \sin \omega t}{}$$

$$V_{DS} > V_{GS} - V_T$$

$$I_D = I_{D,R} + g_m V_p \sin \omega t$$

$$I_D = I_{D,R} + g_m V_S > 0$$

$$V_S > -\frac{I_{D,R}}{g_m} = \frac{200\mu A}{200\mu S} = -1V$$

$$V_{ds,r} + V_S$$

total V_{ds}

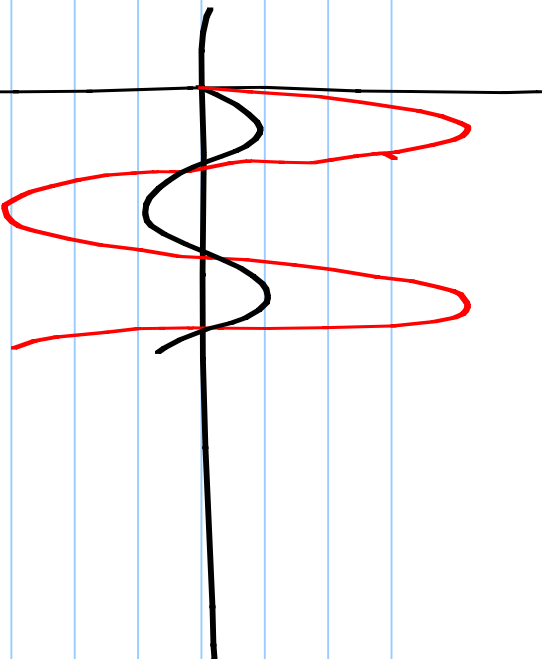
$$V_{ds,r} - g_m(R_D \parallel R_L) \cdot V_S$$

total V_{ds}

$$V_{DS} > V_{GS} - V_T$$

$$V_{ds,r} - g_m(R_D \parallel R_L) V_S > V_{ds,r} + V_S - V_T$$

$$V_S < \left(\frac{V_{ds,r} - V_{GS,r} + V_T}{1 + g_m(R_D \parallel R_L)} \right) = \frac{4V - 3V + 1V}{1 + 10} = \frac{2V}{11}$$

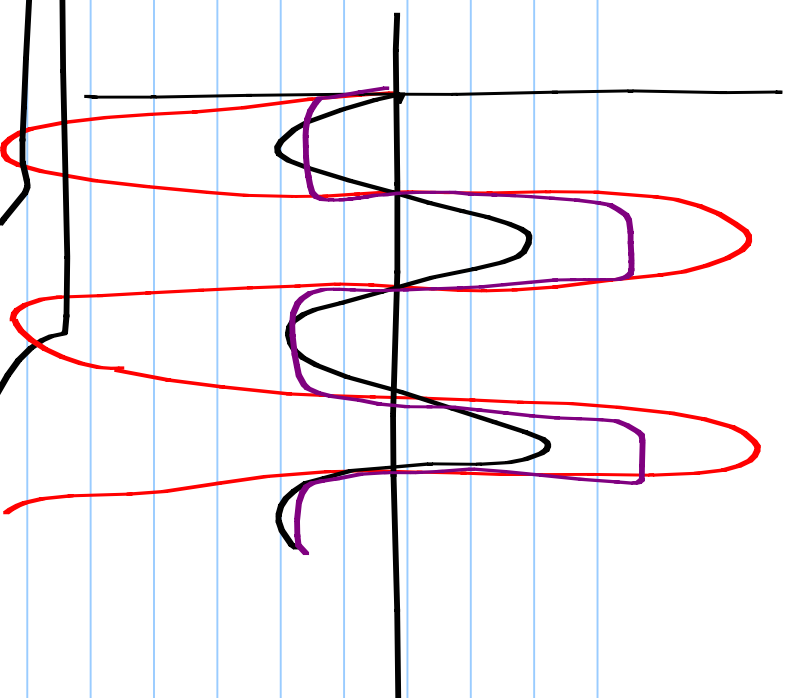


Swing limits

$$\frac{V_{p,d}}{g_m} < V_s < \frac{V_{p,d} - V_{s,d} + V_T}{1 + g_m (R_D \parallel R_L)}$$

$$< V_s <$$

$$\frac{V_{p,d} - V_{s,d} + V_T}{1 + g_m (R_D \parallel R_L)}$$



$$I_D = I_{DQ} + (\text{small signal increment})$$

