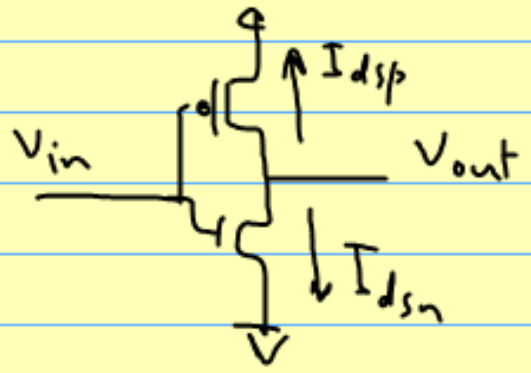
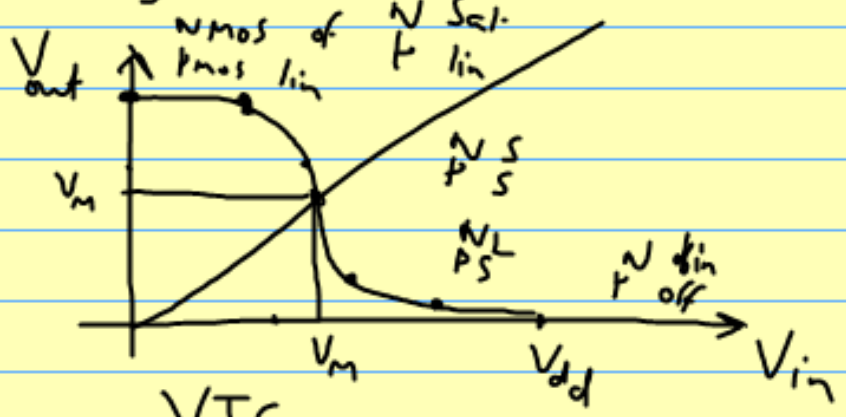
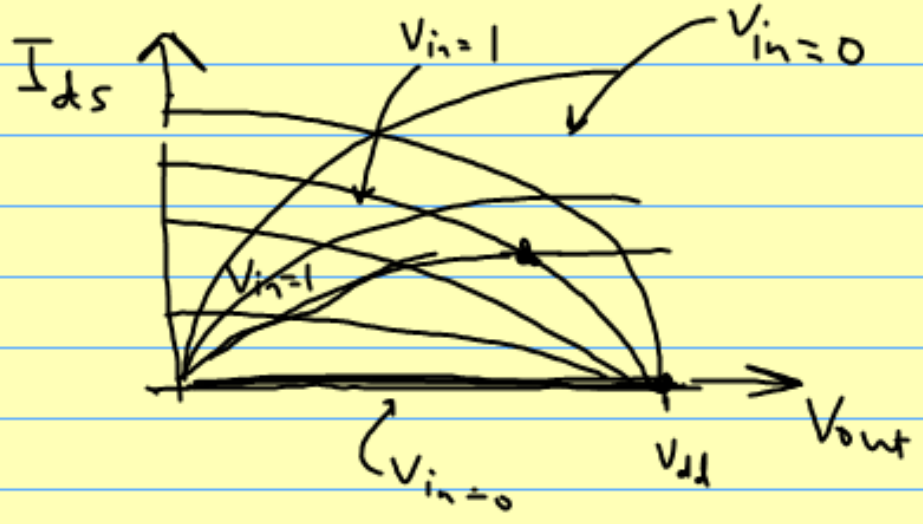
Inverter Analysis





VTC
(Voltage Transfer Curve)



V_M = Switching threshold
(trip point)

V_M

$$I_{ds\,n} = -I_{ds\,p}$$

$$\left(\mu C_{ox}\frac{W}{L}\right)_n \left[k_n\left(V_M - V_{tn} - \frac{V_{dsat\,n}}{2}\right)\cdot V_{dsatn}\right] = -\,k_p\left(V_M - V_{dd} - V_{tp} - \frac{V_{dsatp}}{2}\right)\cdot V_{dsat\,p}$$

$$V_M - V_{tn} - \frac{V_{dsatn}}{2} = -\frac{k_p V_{dsatp}}{k_n V_{dsatn}}\cdot\left(V_M - \cdots\right)$$

$$V_M = \frac{V_{tn} + \frac{V_{dsatn}}{2} + r\left(V_{tp} + \frac{V_{dsatp}}{2} + V_{dd}\right)}{1+r}$$

$r \approx 1$ and V_{dd} large $\Rightarrow V_M \approx \frac{r}{1+r} V_{dd}$