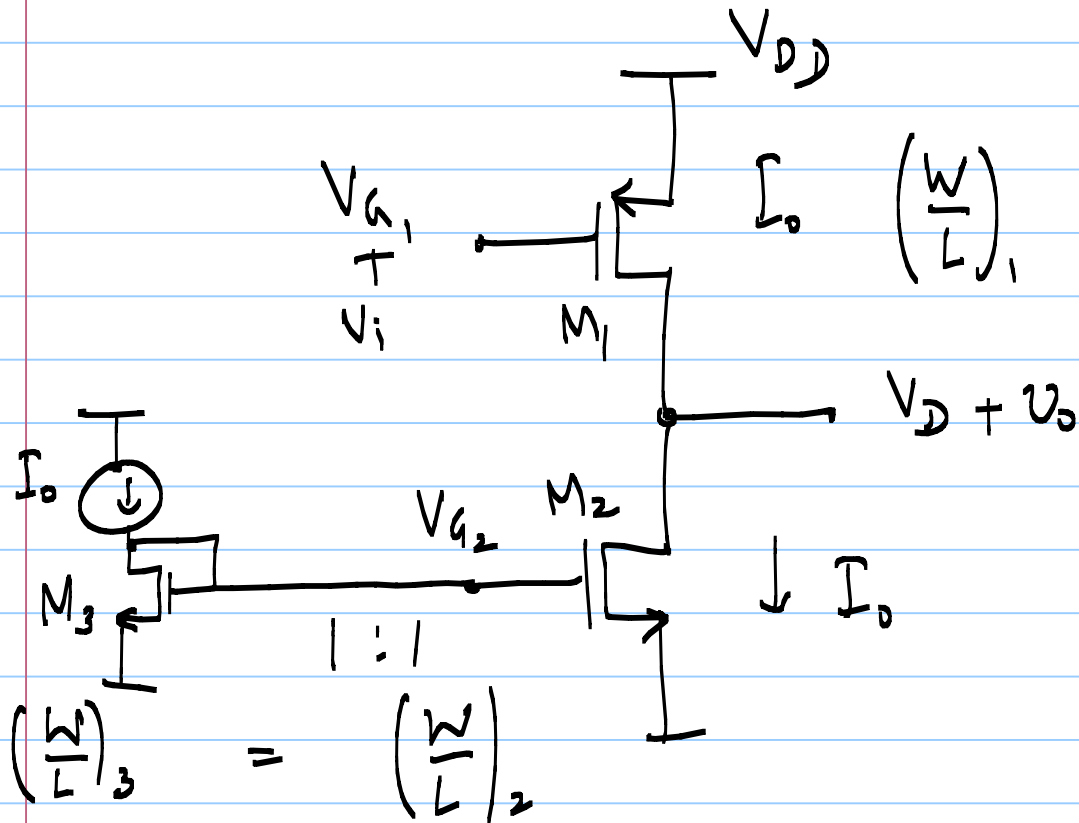


18/9/2020

Lecture 27



— decided by gain, swing limit etc.

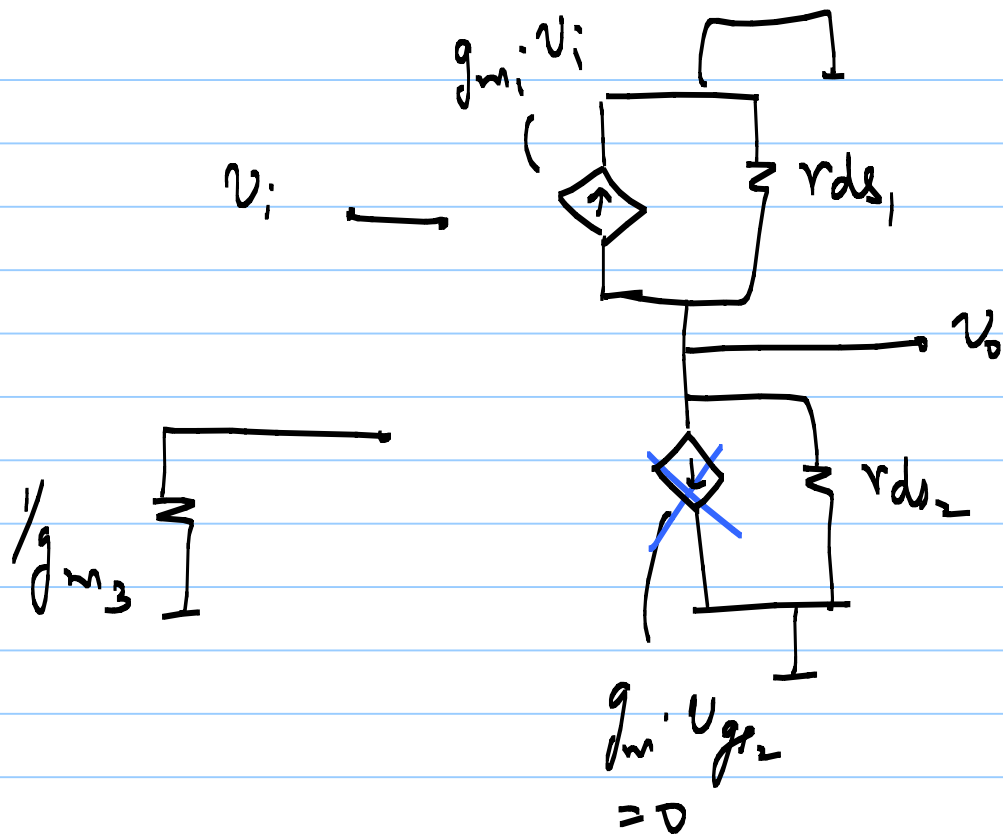
ideal M_1, M_2 & M_3 :

* all $I_D = I_0$

* ideal gain = ∞

* practical gain

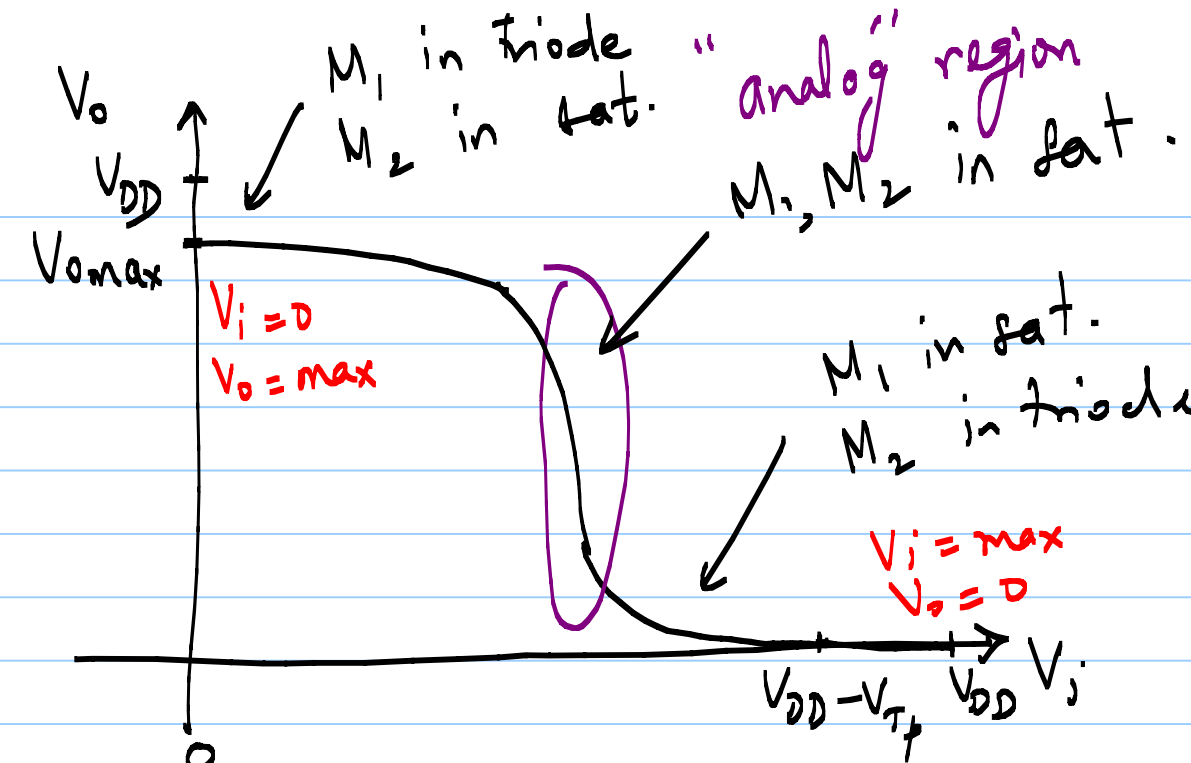
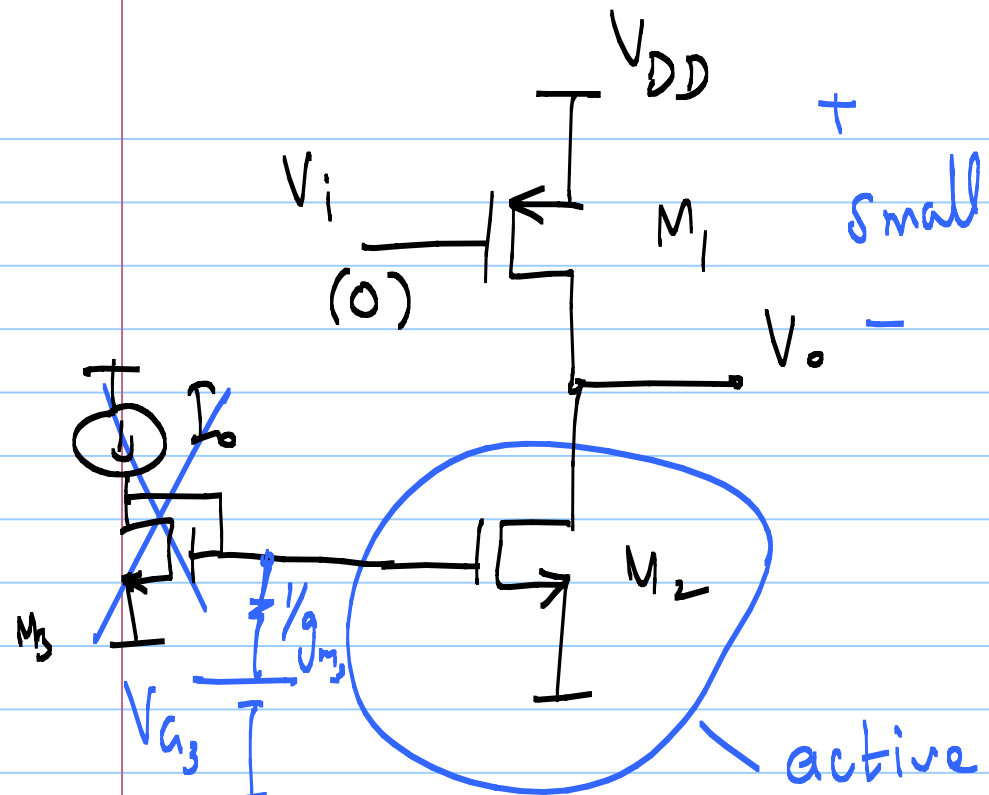
$$= -g_{m1} (r_{ds1} || r_{ds2})$$



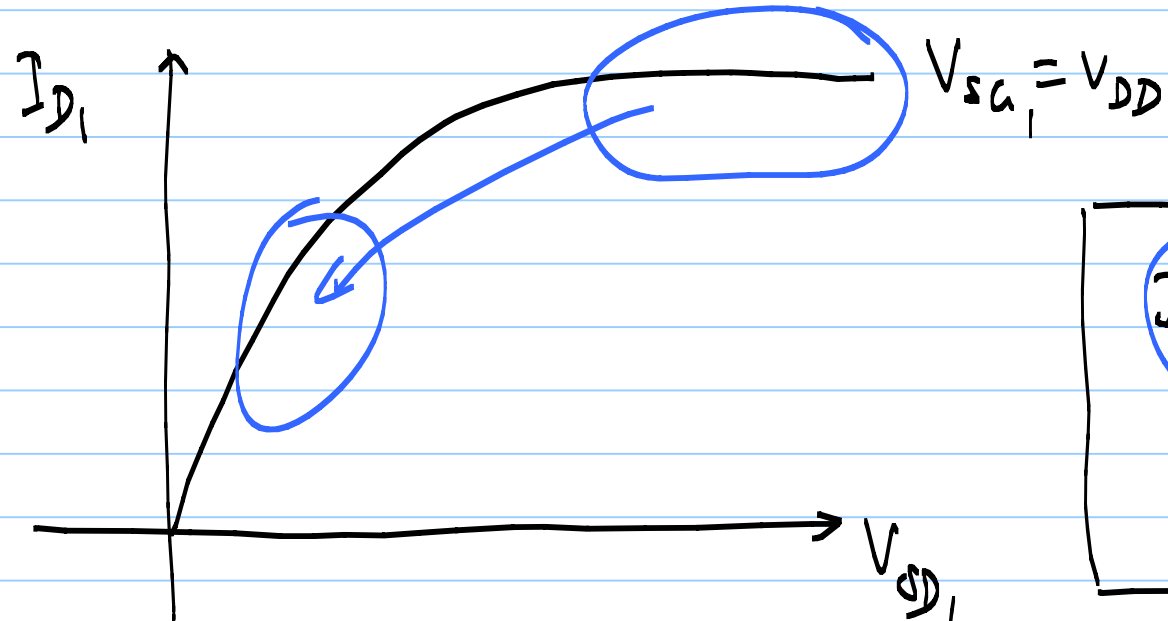
$$\frac{v_o}{v_i} = -g_{m1} (r_{ds1} \parallel r_{ds2})$$

V_{Tn} = threshold voltage of NMOS

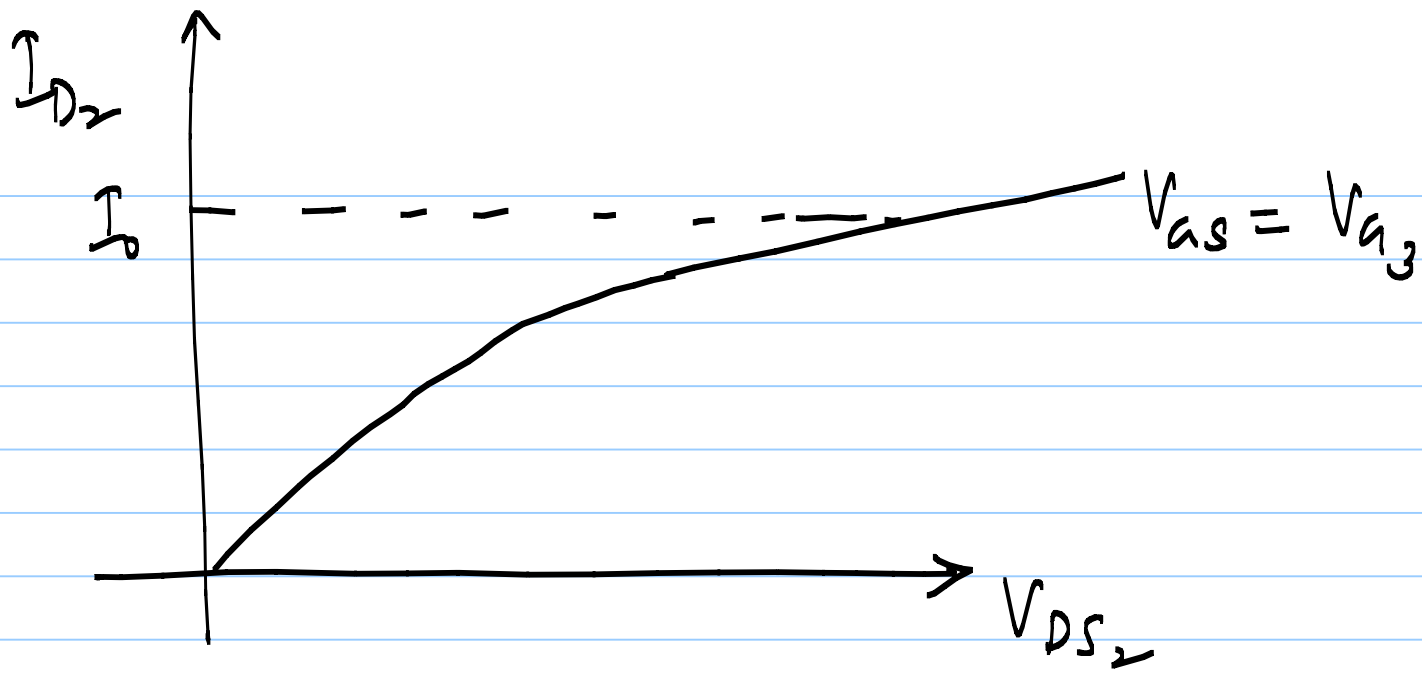
V_{Tp} = threshold voltage of PMOS



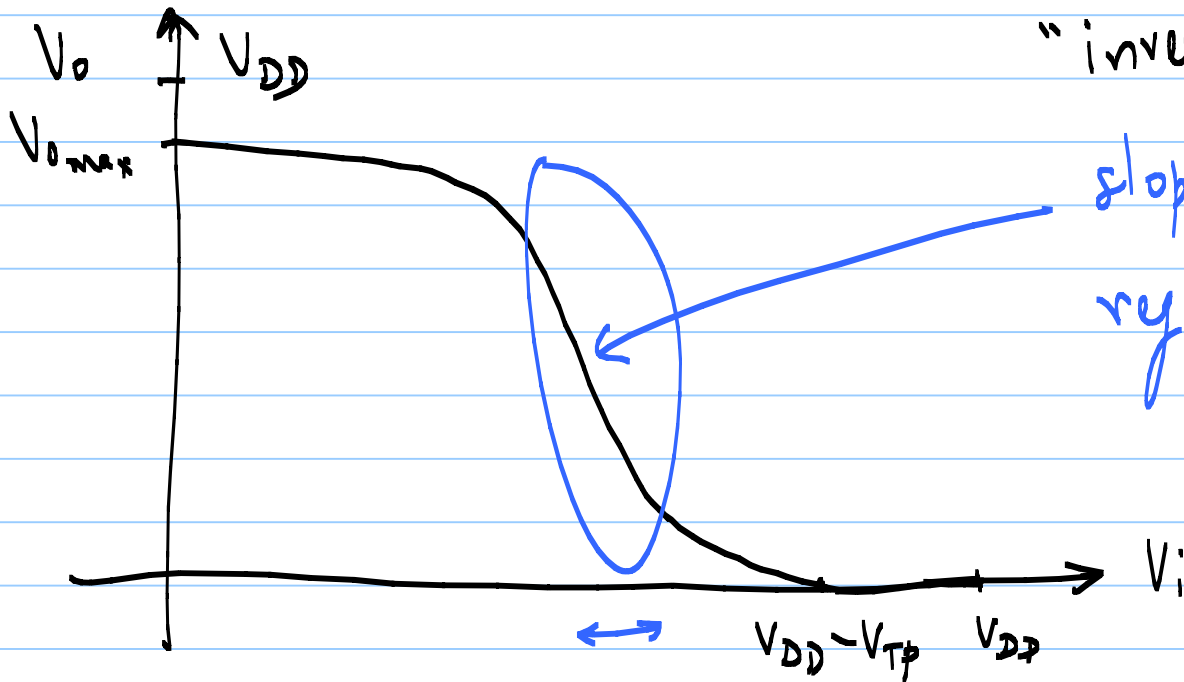
One type of digital inverter



$I_{D1} = I_{D2}$
 always!



(a) $V_i = V_{DD} - V_{TP} : \hat{I}_{D1} = 0$



"inverting amplifier"

slope in analog

$$\text{regim} = \frac{dV_o}{dV_i} = \frac{V_o}{V_i}$$

$$= -g_m (r_{ds1} || r_{ds2})$$

$V_{o\max}$

Triode $I_{D1} = \text{Sat. } I_{D2}$

In this course : normally for bias point
calculations - ignore effect of λ