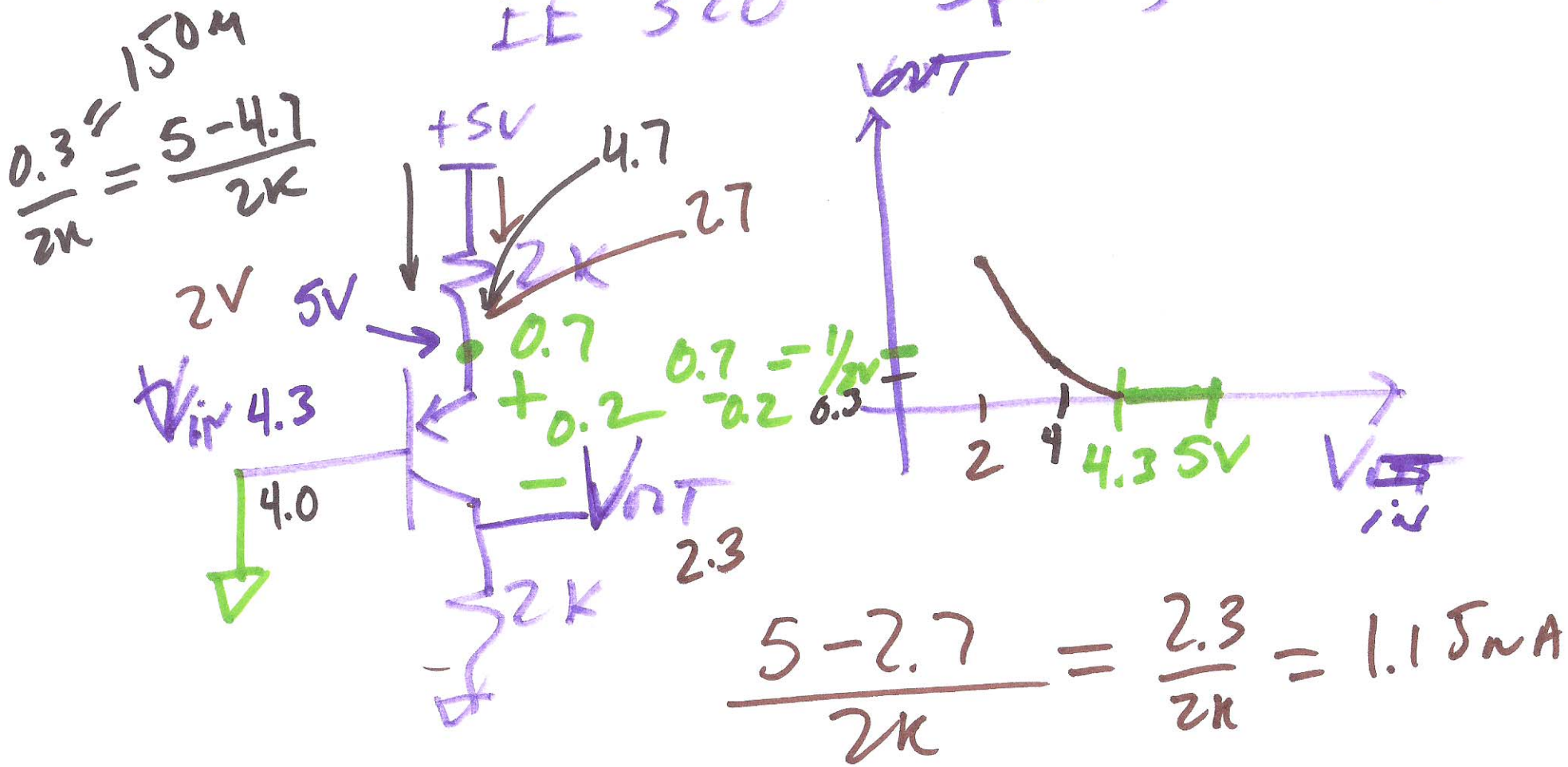
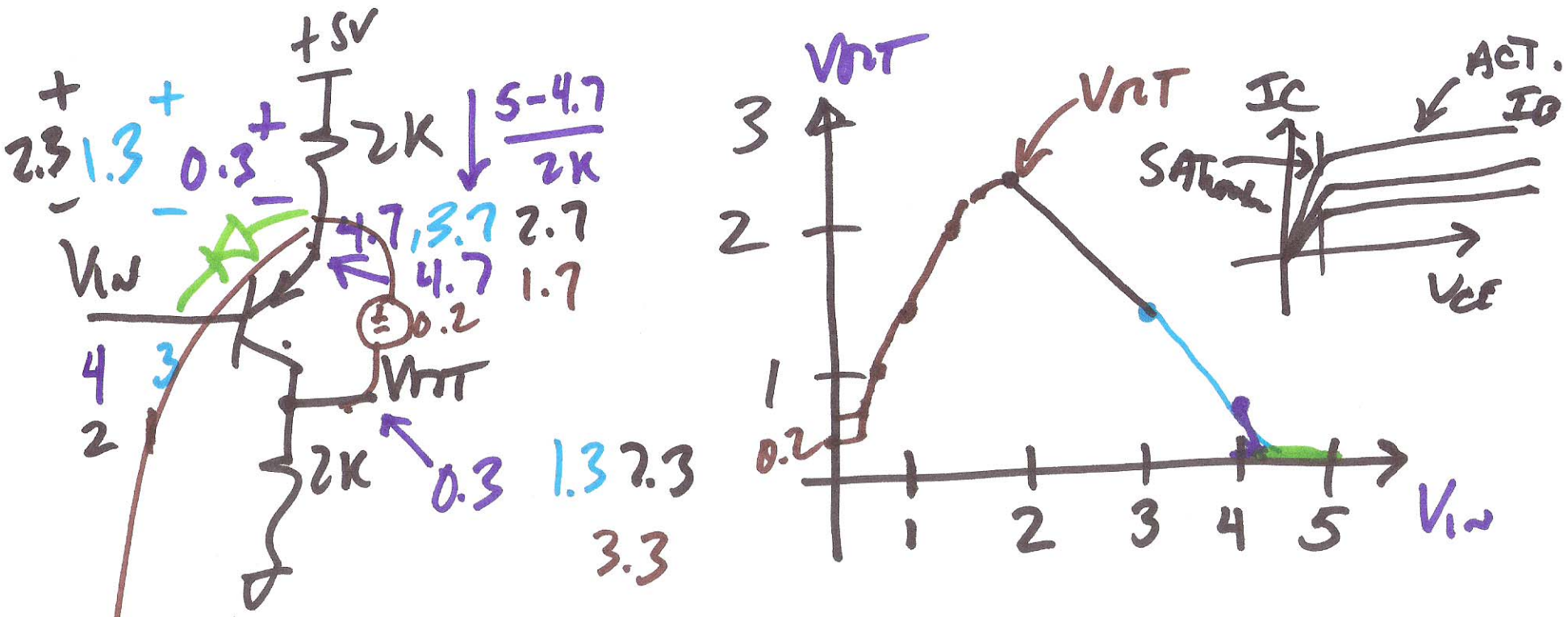
Lecture 25

April 27, 2015

EE 320 Spring 2015

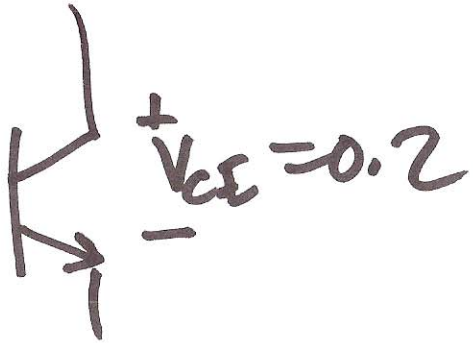


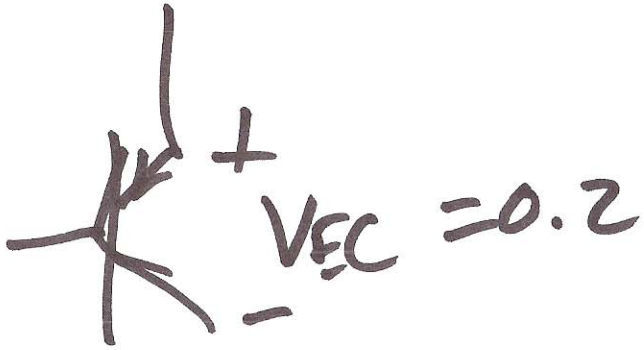
$$\frac{5-2.7}{2k} = \frac{2.3}{2k} = 1.15mA$$



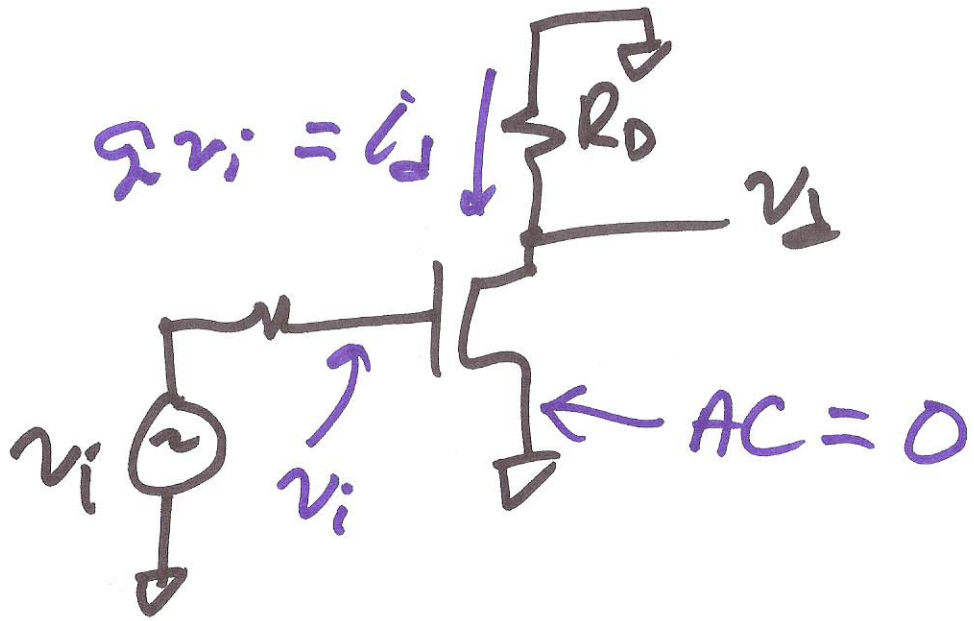
$$V_{OUT} = V_{in} + 0.7 - 0.2 = V_{in} + 0.5$$

$V_{in} + 0.7$





$$g_m = \sqrt{2K_p \frac{W}{L} I_D} = K_p \frac{W}{L} (V_{GS} - V_{TH})$$

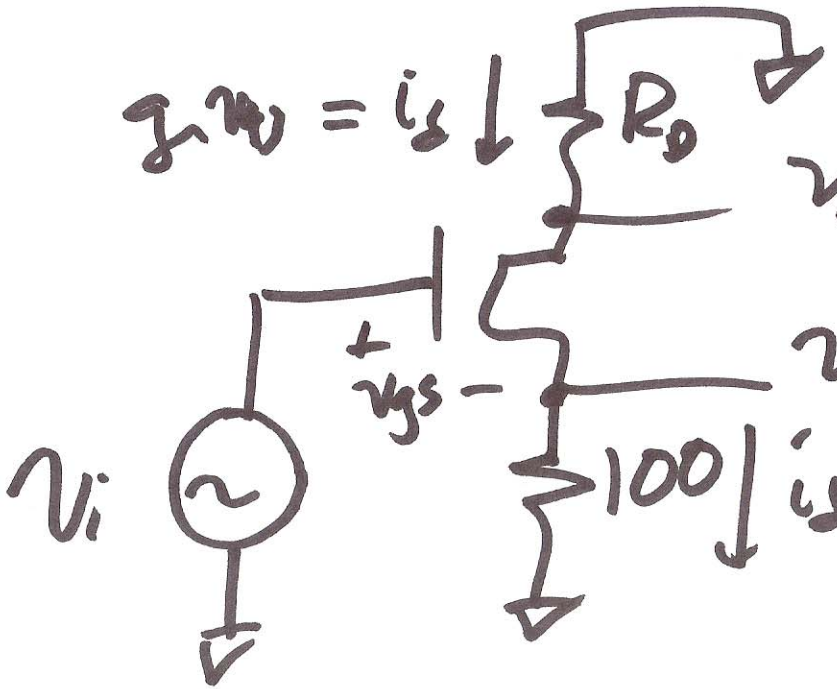


$$v_{gs} = v_i$$

$$i_d = g_m v_{gs} = g_m v_i$$

$$v_d = -g_m v_i \cdot R_D$$

$$\frac{v_d}{v_i} = -g_m R_D$$



$i_d = g v_{gs}$

$v_s = i_d \cdot 100$

$$\frac{v_d}{v_i} = \frac{-R_D}{\frac{1}{g} + 100}$$

$$v_i = v_{gs} + i_d \cdot 100 = \frac{i_d}{g} + i_d \cdot 100$$

$$v_{gs} = v_i - i_d \cdot 100$$

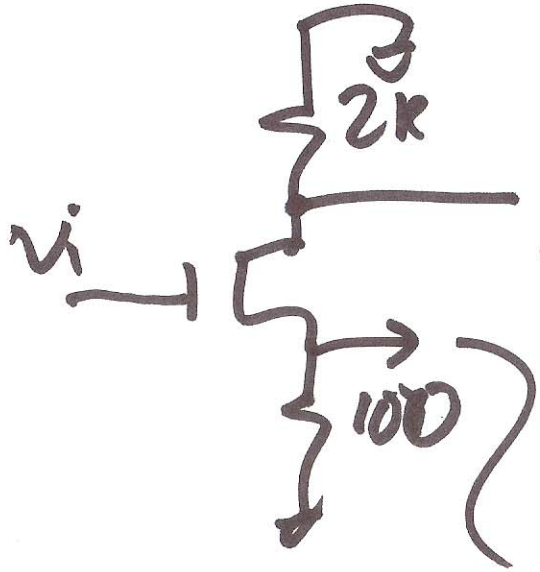
$$v_d = -i_d \cdot R_D = -g v_{gs} \cdot R_D$$

$$= -g(v_i - i_d \cdot 100)$$

$$g_m = \sqrt{2 \cdot 100\mu \cdot \frac{100}{1} \cdot 1mA} = \sqrt{2 \cdot 10K \cdot 10^{-9}}$$

$$= \sqrt{20\,10^{-6}}$$

$$= 4.4 \frac{mA}{V}$$



$$\frac{v_o}{v_i} = \frac{2k}{2k + 100} \approx \frac{2k}{2k} = 6.1$$

$$= \frac{2k}{220}$$

$$\frac{1}{g_m} \simeq 220$$

$$\frac{v_s}{v_i} = \frac{100}{100 + 220} = 0.3$$

$$= \frac{R_s}{R_s + \frac{1}{g_m}}$$