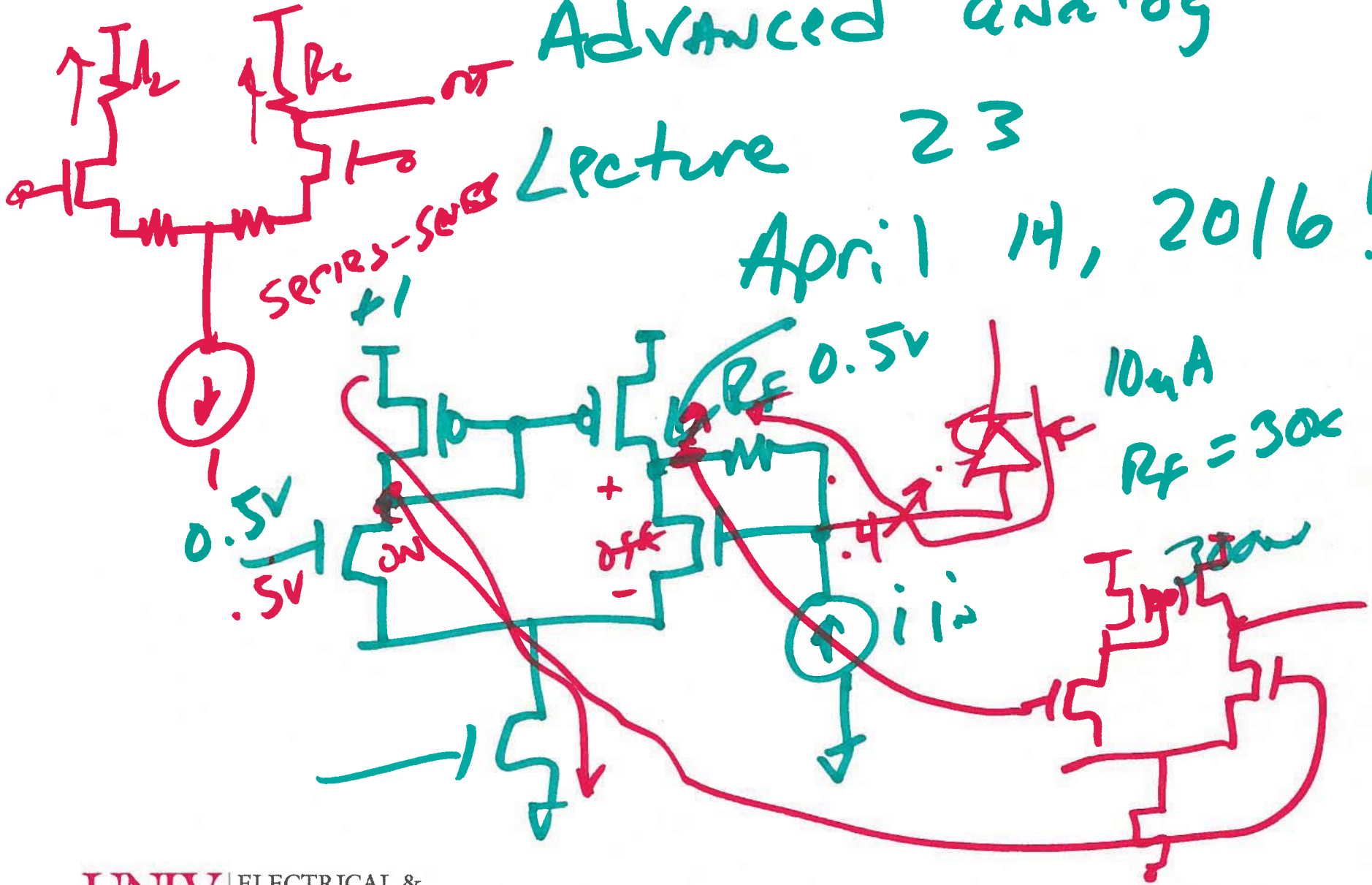


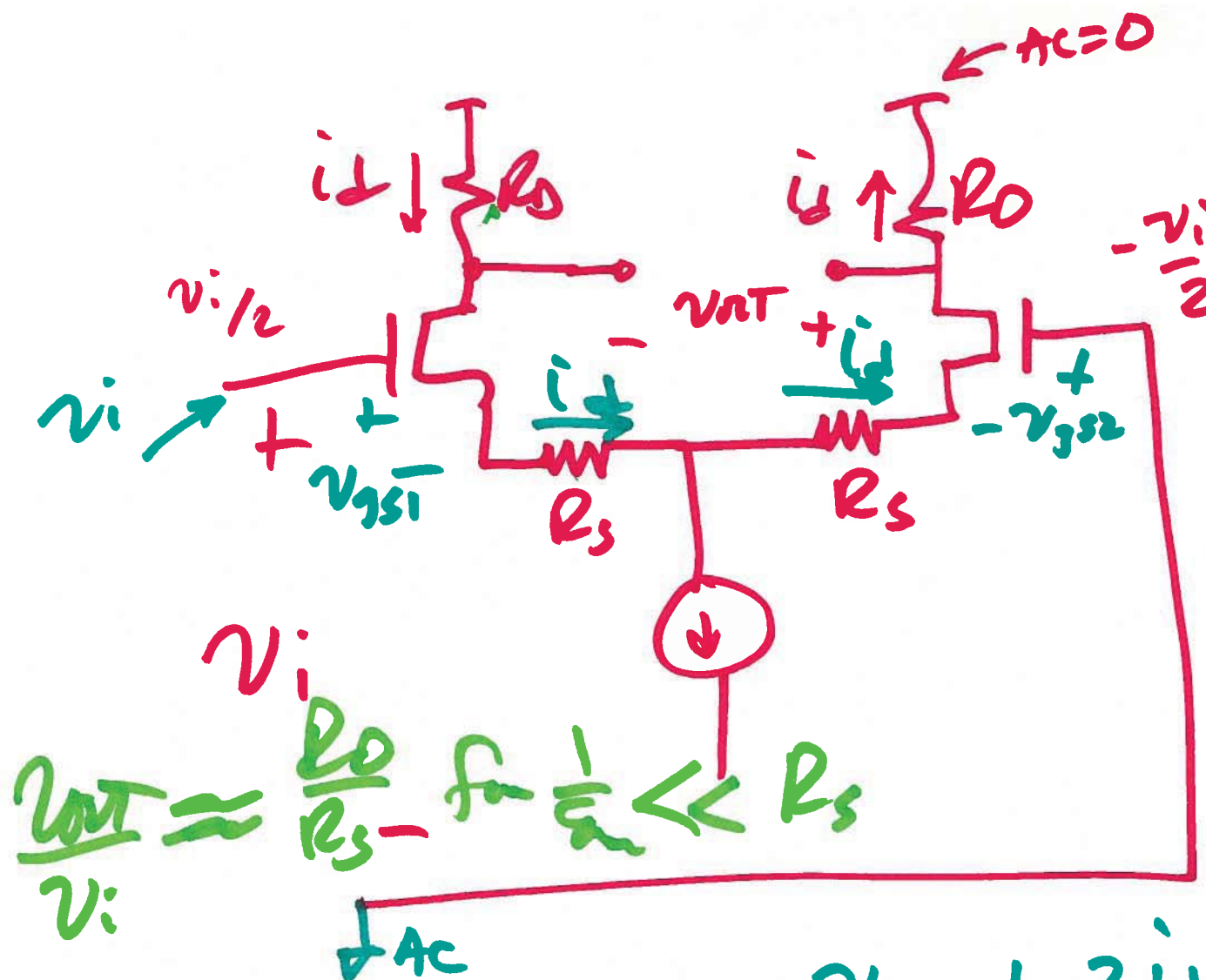
# ECE 720

## Advanced analog

### Lecture 23

April 14, 2016!





$$v_{out} = i_D \cdot R_D - (-i_D \cdot R_D)$$

$$= 2i_D \cdot R_D$$

$$\frac{v_{out}}{v_i} = \frac{2i_D \cdot R_D}{2i_D \cdot (\frac{1}{g_m} + R_S)}$$

$$= \frac{R_D}{\frac{1}{g_m} + R_S}$$

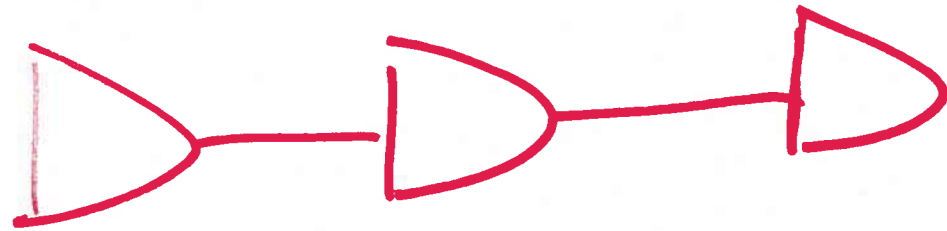
$$\frac{v_{out}}{v_i} \approx \frac{R_D}{R_S} \text{ for } \frac{1}{g_m} \ll R_S$$

$$v_i = v_{gs1} + 2i_D \cdot R_S - v_{gs2}$$

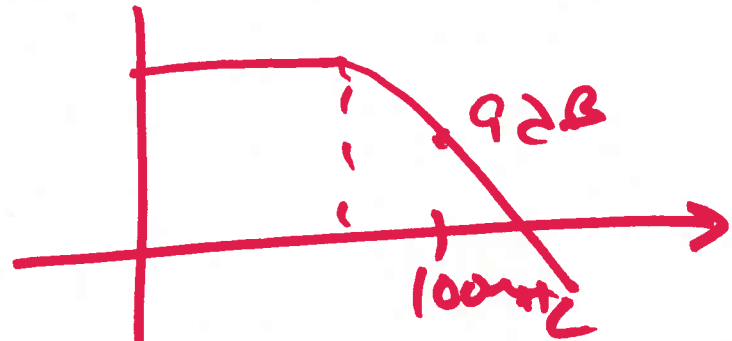
$$= 2v_{gs1} + 2i_D \cdot R_S$$

$$v_i = 2\left(\frac{1}{g_m} + R_S\right)i_D$$

2)



$$G = \frac{1}{1 + j \frac{f}{100 \text{ kHz}}}$$



$$\left| \frac{K}{\left(1 + \left|\frac{f}{100 \text{ kHz}}\right|^2\right)^{3/2}} \right|$$

$$\left(1 + \left(\frac{f}{100 \text{ kHz}}\right)^2\right)^{3/2} = 2^{3/2}$$

$$\left(1 + \left(\frac{f}{100 \text{ kHz}}\right)^2\right)^{3/2} = (2)^{3/2}$$

$$1 - 2^{1/3} = \left(\frac{f_{92B}}{100 \text{ kHz}}\right)^2$$

3)

$$(1 - 2^{-1/3}) = \frac{f_{3dB}}{100\text{kHz}}$$

$$f_{3dB} = 100\text{kHz} \cdot \sqrt{1 - 2^{-1/3}}$$

1.25