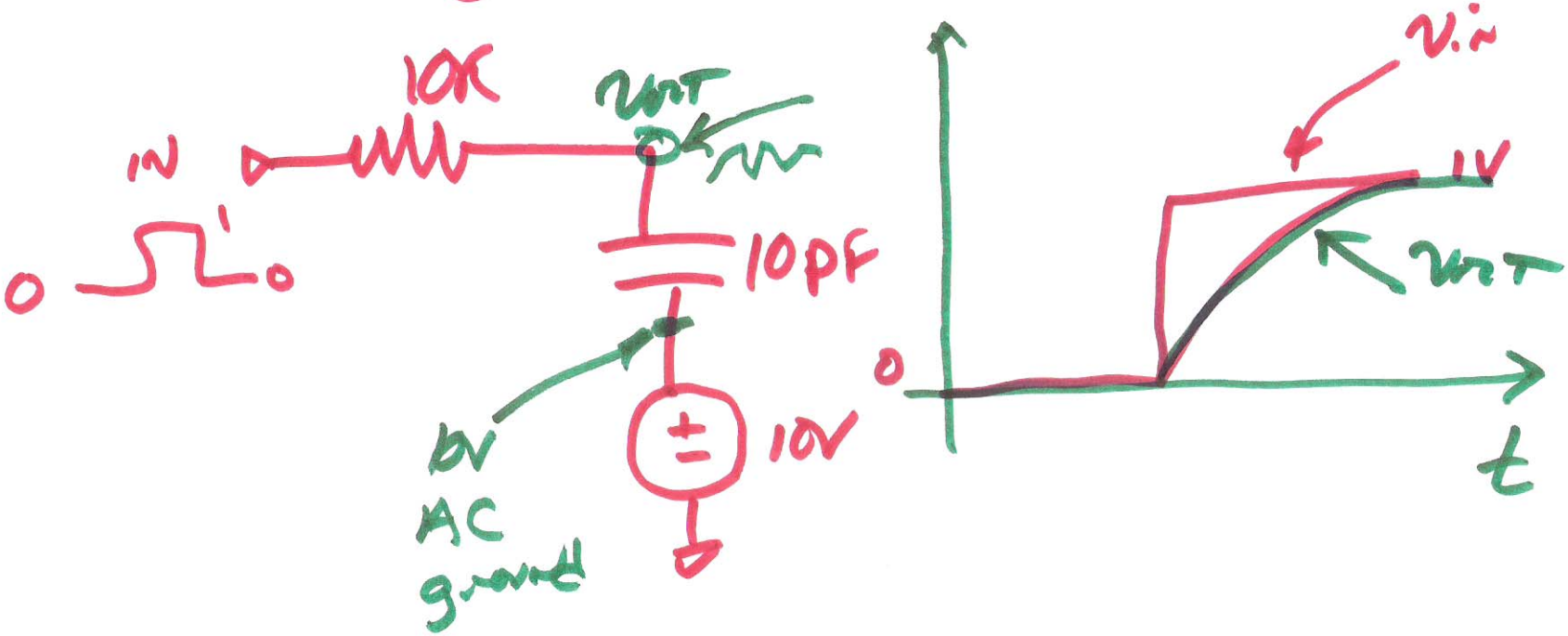
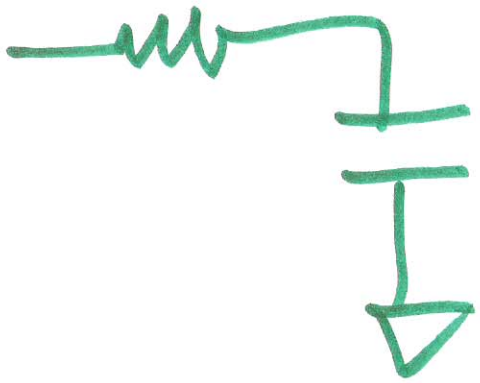
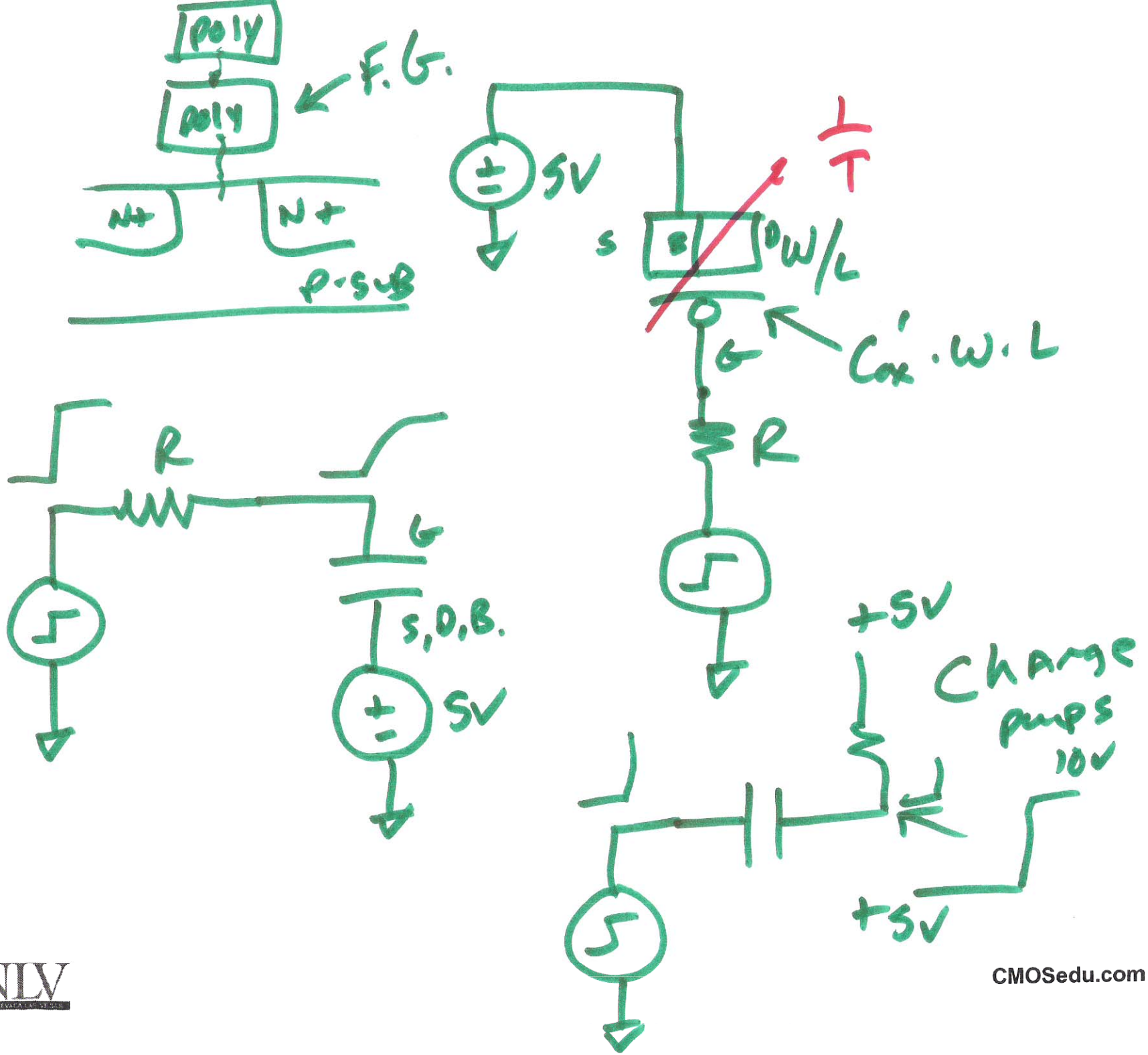
EE 422 And ECE 622
Analog IC Design







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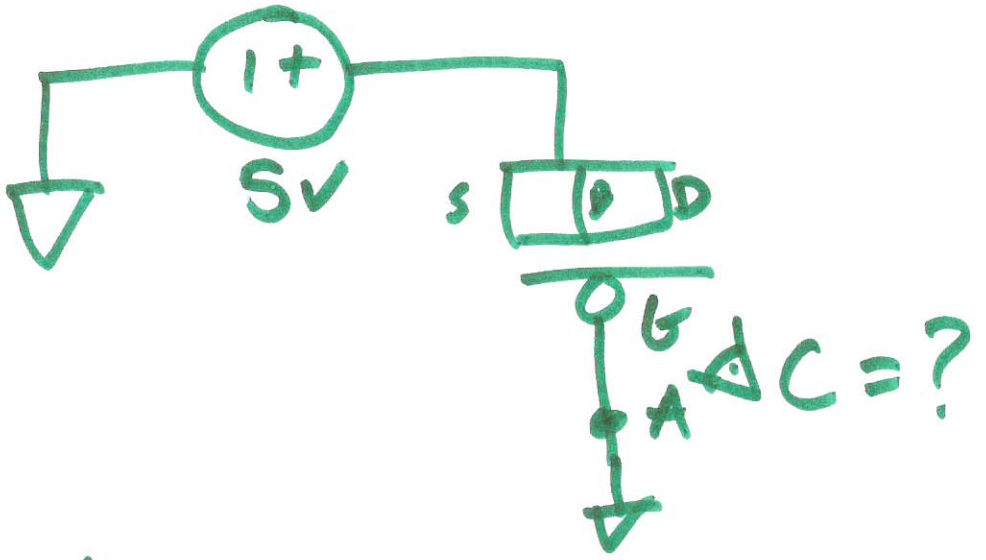
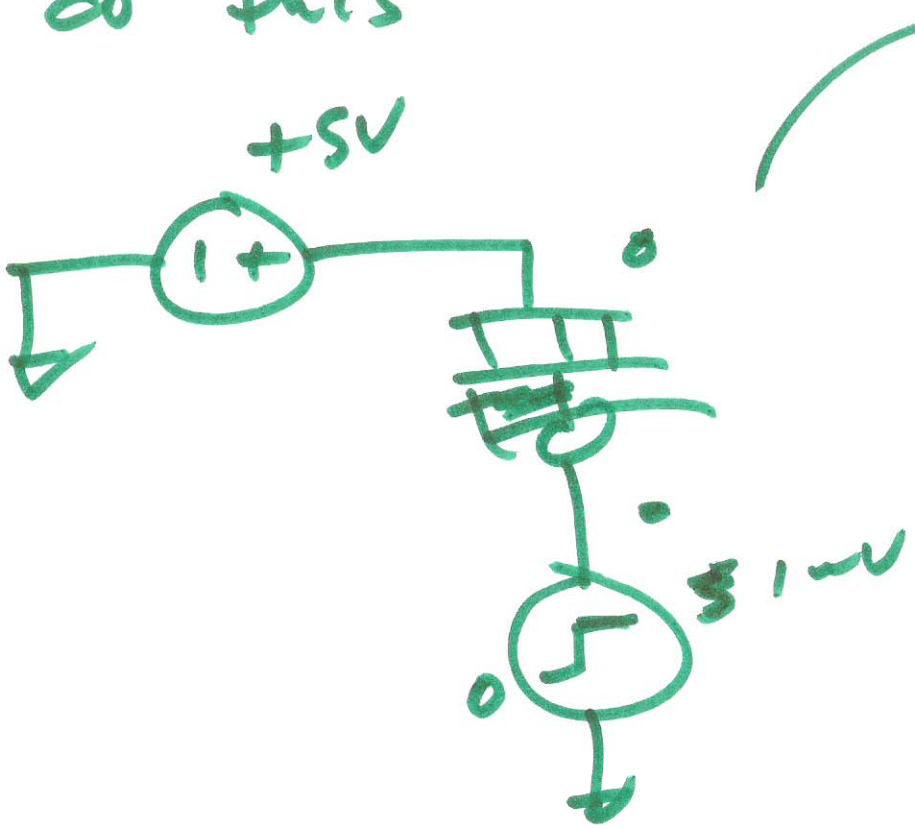
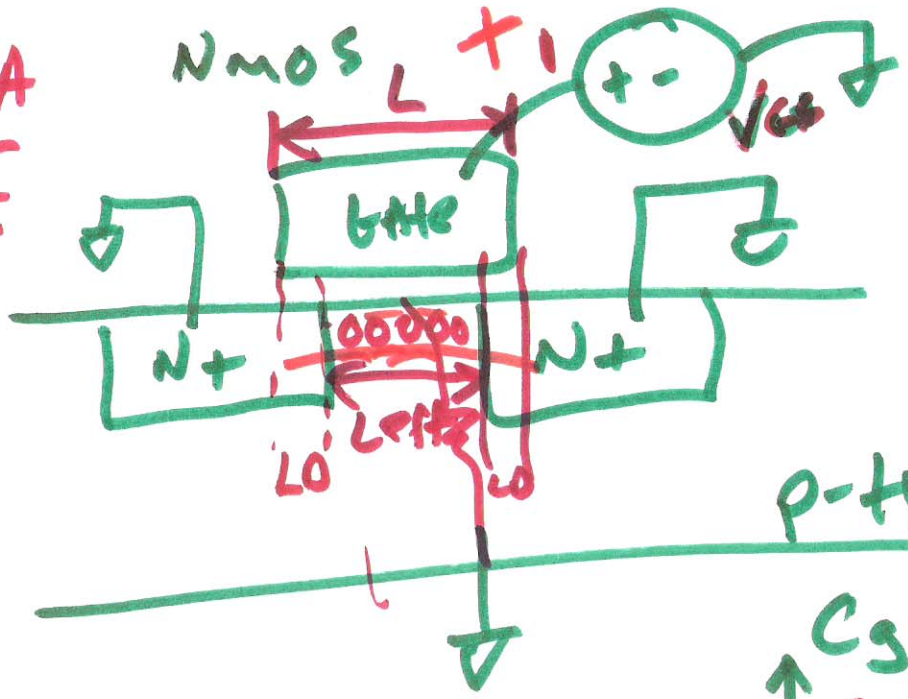


Don't do this



$C = \frac{\varepsilon A}{t}$



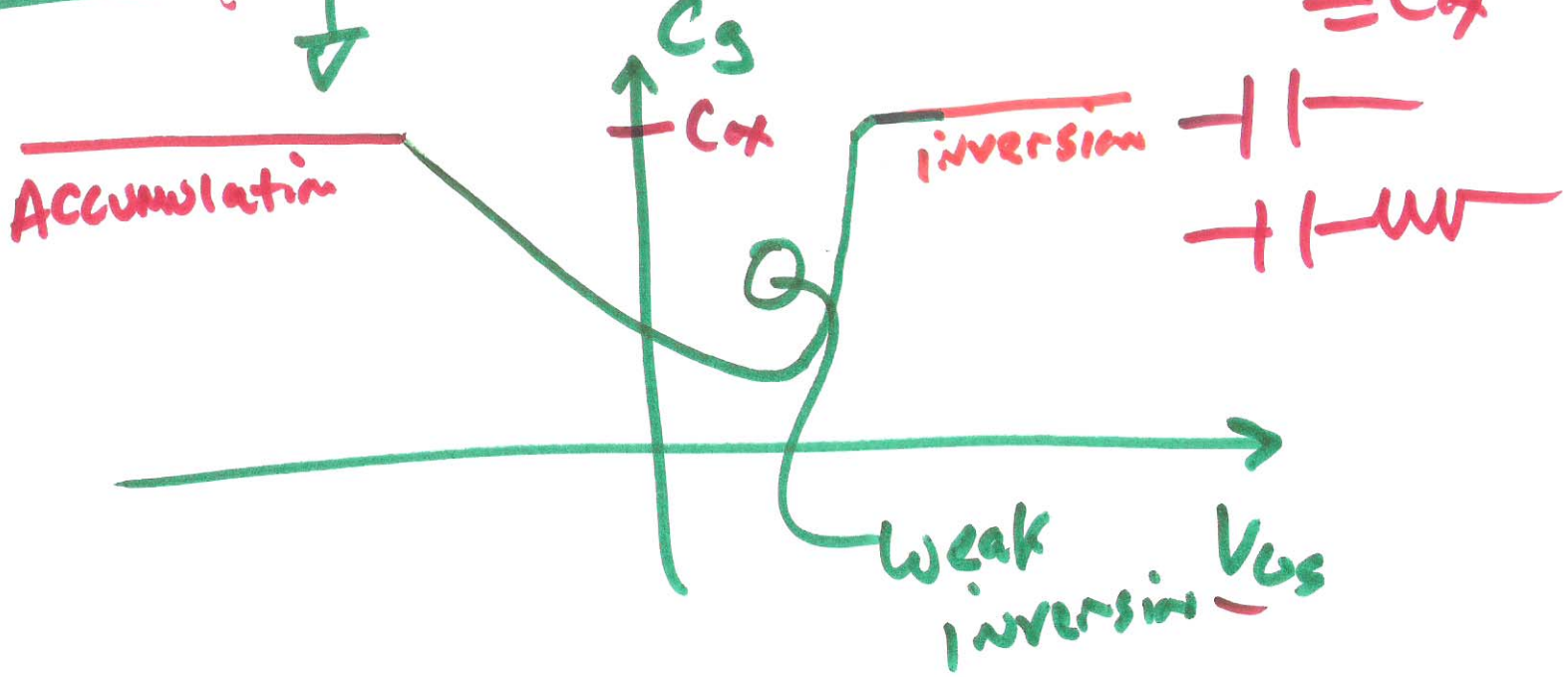
$C_g = 2 \cdot LD \cdot W \cdot C_{ox}'$

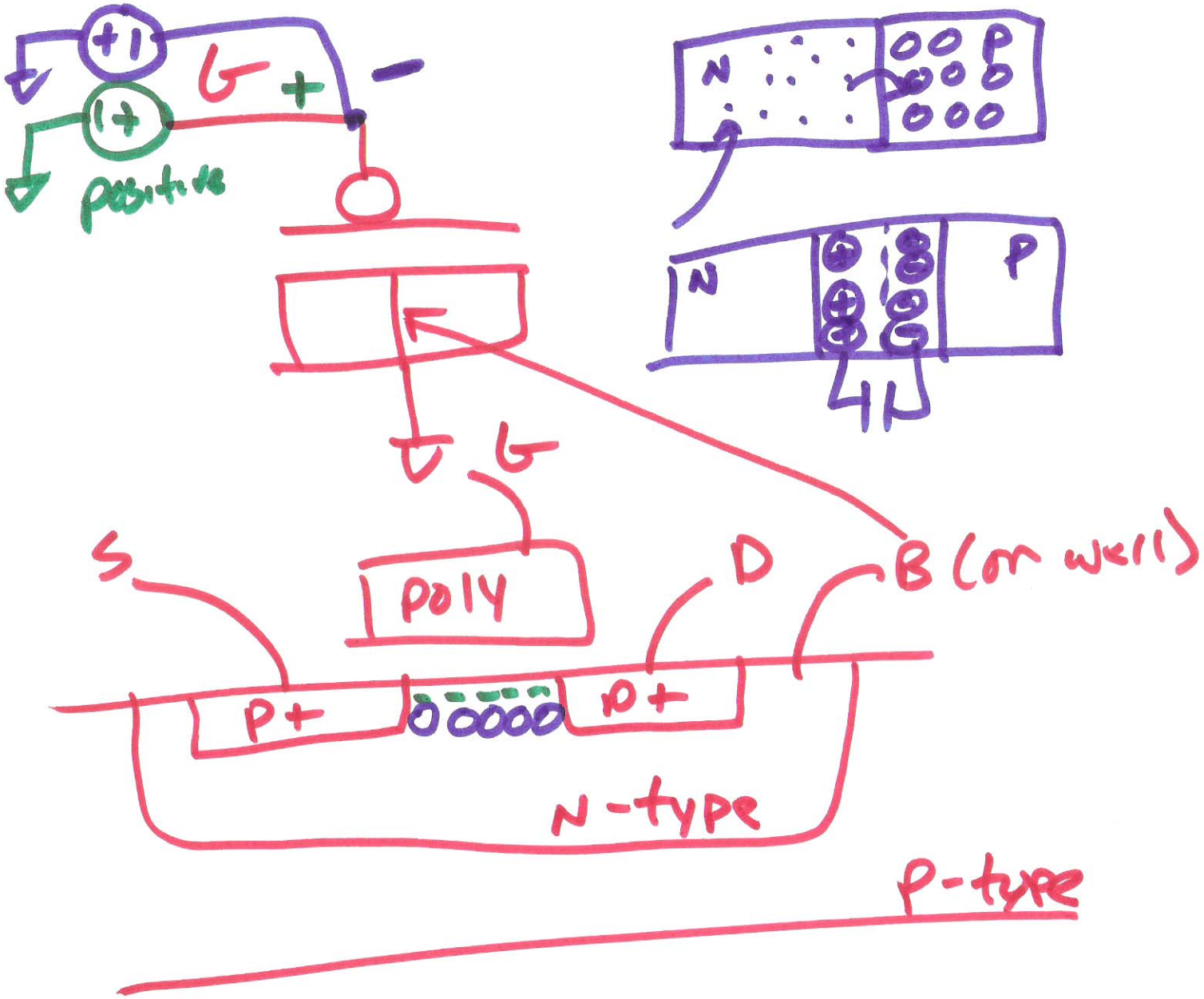
$+ \frac{2}{3} Leff \cdot W \cdot C_{ox}'$

$L = L_{eff} + 2LD =$

$= C_g = C_{ox}' \cdot L \cdot W$

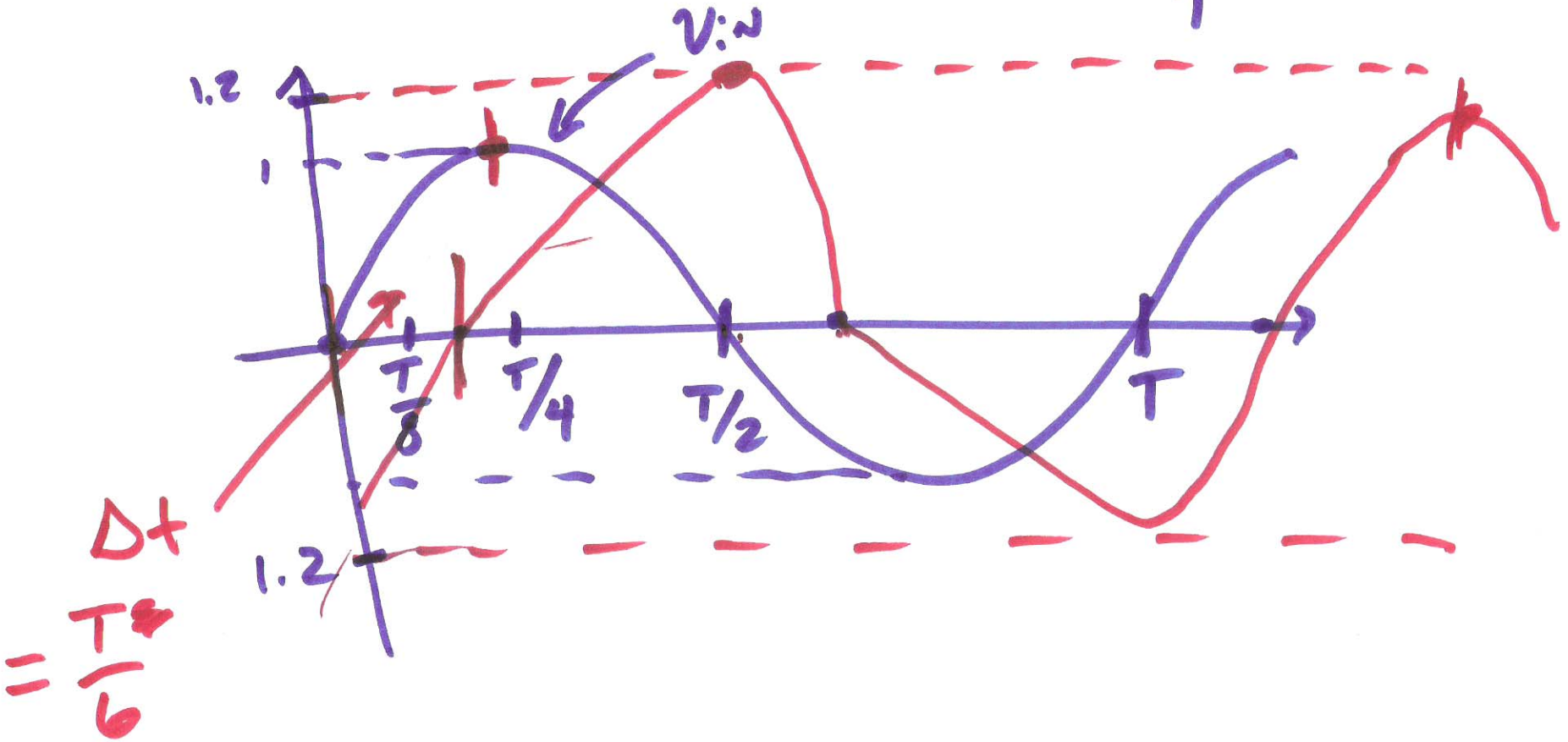
$= C_{ox}$



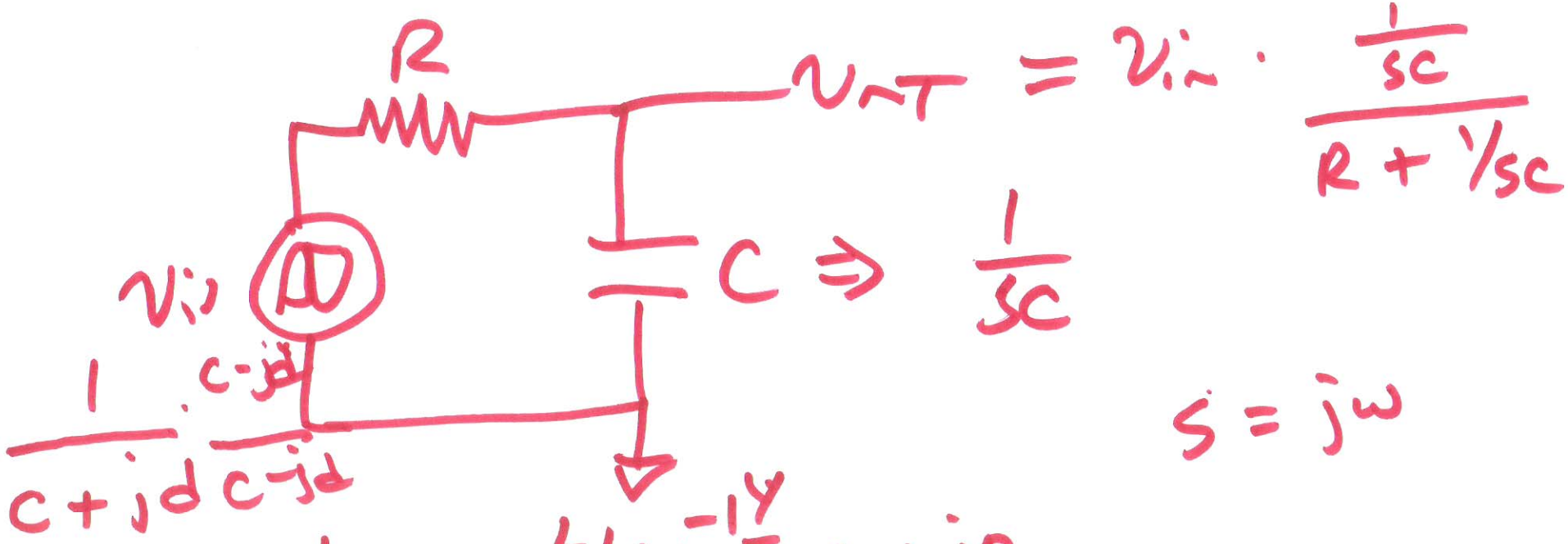

+1
+
positive
G
+
−
N
P
N
P
4λ
G
S
poly
D
B (on well)
P+
n+
N-type
P-type

$\left|\frac{v_o}{v_i}\right| = 1.2$ $\quad \angle v_o/v_i = -60°$

$\frac{\Delta t}{T} \cdot 360 = \theta$



$\Delta t = \frac{T}{6}$



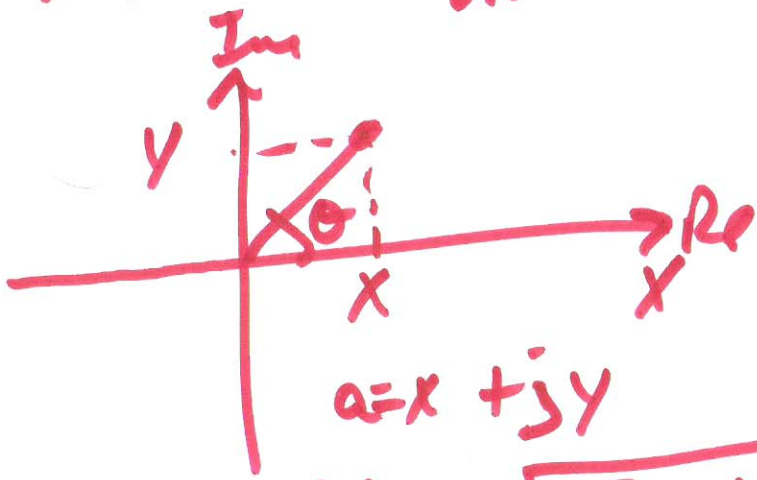
$$v_{out} = v_{in} \cdot \frac{\frac{1}{sC}}{R + \frac{1}{sC}}$$

$$s = j\omega$$

$$\left|\frac{1}{C+jd}\right| = \frac{1}{\sqrt{C^2+d^2}} \qquad \angle \tan^{-1}\frac{y}{x}$$

$$\frac{v_{out}}{v_{in}} = \frac{1+j0}{1+j\omega RC}$$

$$\left|\frac{v_{out}}{v_{in}}\right| = \frac{\sqrt{1^2+0^2}}{\sqrt{1+(2\pi f RC)^2}}$$



$a = x + jy$

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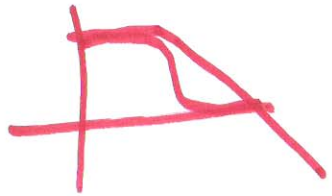
$|a| = \sqrt{x^2+y^2}$, $\theta = \tan^{-1}\frac{y}{x}$

$$\left|\frac{v_o}{v_i}\right| = \frac{1}{\sqrt{1+(2\pi f RC)^2}}$$

$$f_{3dB} = \frac{1}{2\pi RC}$$

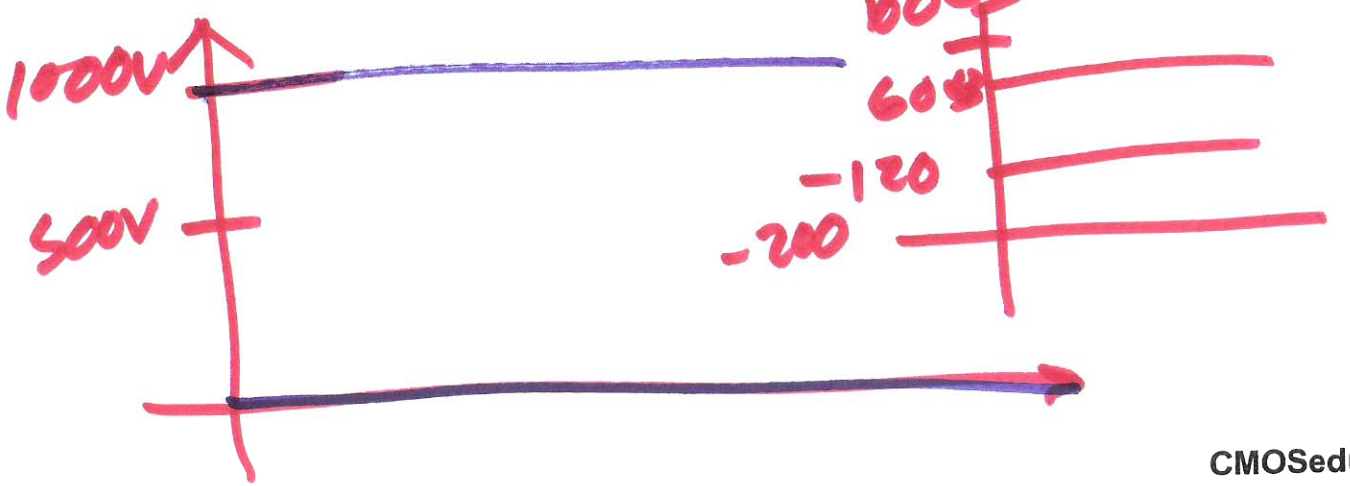
$$\angle\frac{v_o}{v_i} = 0 - \tan^{-1}\frac{2\pi f RC}{1}$$



$$\frac{1}{\sqrt{1+\left(\frac{f}{f_{3dB}}\right)^2}}$$

$20\log(1000) = 60\,dB$ ——— 1000 V

$20\log 10^{-6} = -120\,dB$ ——— 1 μV



8)

decades $\times 10$ $\div 10$

1KHz → 10K

1 decade above

octaves $\times 2$ $\div 2$

123 Hz

12.3 Hz

+20 dB → $\times 10$

−20 dB → $\div 10$

6 dB → $\times 2$

−6 dB → $\div 2$

14 dB → $\times 5$

6 dB → $\times 2$

3 dB → $1.414\ \sqrt{2}$

$-3\text{dB} \Rightarrow \frac{1}{\sqrt{2}}$

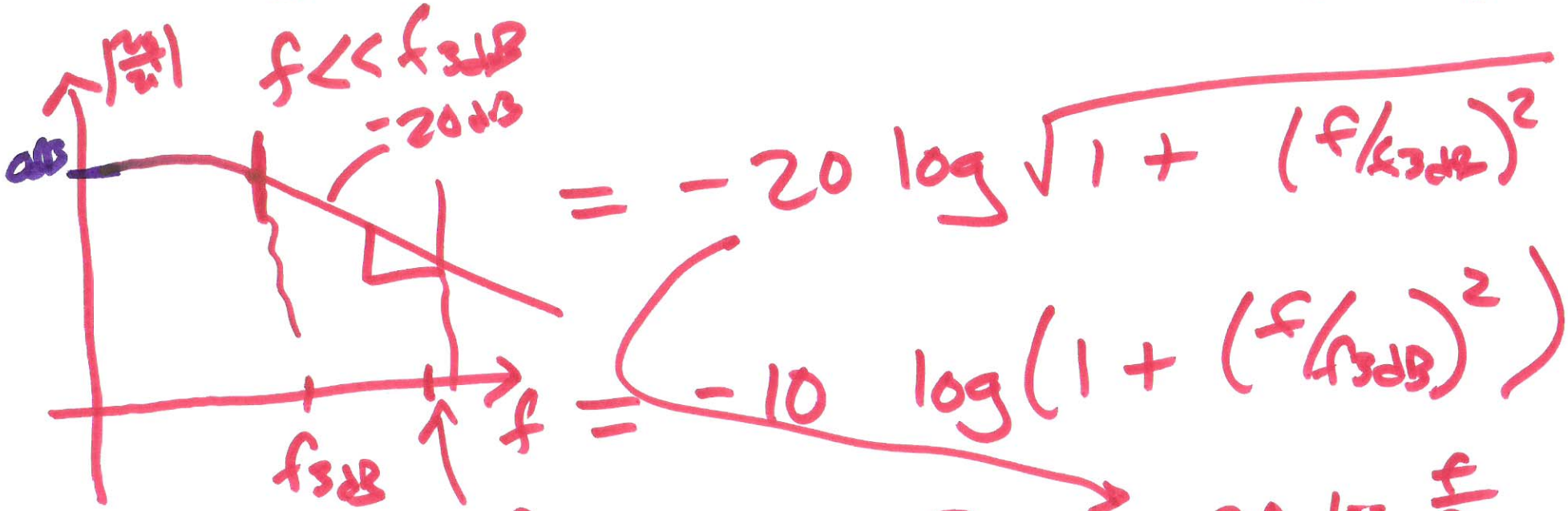
.707

$20 \log \frac{1}{\sqrt{2}} = -3$

$$\left|\frac{V_{out}}{V_{in}}\right| = \frac{1}{\sqrt{1+(2\pi RCf)^2}} = \frac{1}{\sqrt{1+(f/f_{3dB})^2}}$$

$$f_{3dB} = \frac{1}{2\pi RC}$$

$$20\log\left|\frac{V_{out}}{V_{in}}\right| = 20\log\frac{1}{\sqrt{1+(f/f_{3dB})^2}}$$



$$= -20\log\sqrt{1+(f/f_{3dB})^2}$$

$$= -10\log(1+(f/f_{3dB})^2)$$

$$f >> f_{3dB} \quad -20\log\frac{f}{f_{3dB}}$$