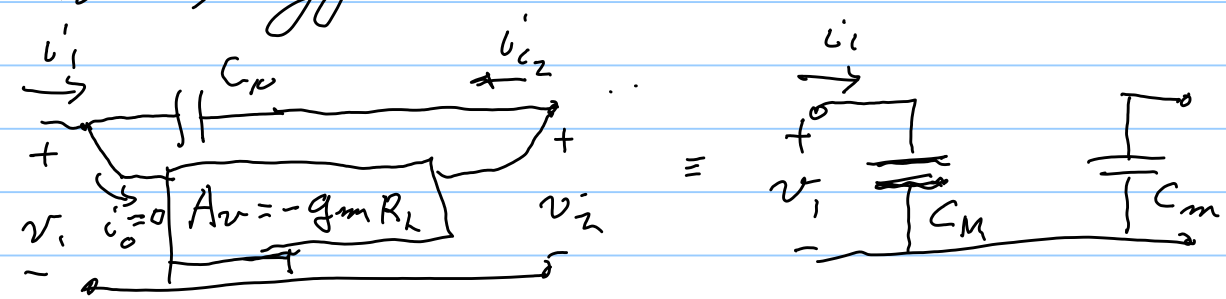
Note Title 3/5/2018

EE 307
03/05/18

Miller effect:



$$i_1 = s C_\mu (v_1 - v_2) = s C_\mu (v_1 - (A_v) \cdot v_1) = s C_\mu (1 - A_v) v_1$$

$$y_{in}(s) = \frac{i_1}{v_1} = s C_\mu (1 - A_v) \Rightarrow C_M = C_\mu (1 - A_v) \Rightarrow \text{increases if } |A_v| \text{ is large}$$

$$i_{c_2}' = i_{c\,out}'(s) = s C_\mu (v_2 - v_1) = s C_\mu \left(v_2 - \frac{1}{A_v} v_2\right) = s C_\mu \left(1 - \frac{1}{A_v}\right) v_2$$

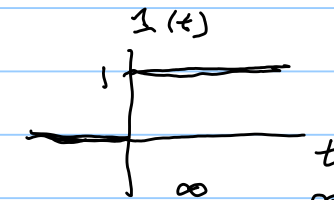
$$C_m = C_\mu \left(1 - \frac{1}{A_v}\right) \Rightarrow \text{decreases}$$

can make larger C's this way.

bilateral Laplace transform

$$\mathcal{L}[x] = \int_{-\infty}^{\infty} x(t)\, e^{-st}\, dt$$

Look at $x(t) = X e^{at}\, 1(t)$ $\qquad 1(t) = \begin{cases} 1 & t>0 \\ 0 & t<0 \end{cases}$



$$\mathcal{L}[e^{at} 1(t)] = \int_{-\infty}^{\infty} e^{at} e^{-st}\, 1(t)\, dt = \int_{0}^{\infty} e^{-(s-a)t}\, dt = \frac{1}{-(s-a)}\, e^{-(s-a)t}\Big|_0^{\infty}$$

$$= -\frac{1}{s-a}\left[e^{-(s-a)\infty} - e^{-(s-a)0}\right]$$

Let $\tau = -(s-a)t$

$d\tau = -(s-a)\,dt$

requires $e^{-(s-a)\infty}$ to be finite $\Rightarrow \mathrm{Re}(s-a) \geq 0$

$$\mathcal{L}[e^{at} 1(t)] = \frac{1}{s-a} \quad \text{for } \sigma > \mathrm{Re}\, a$$