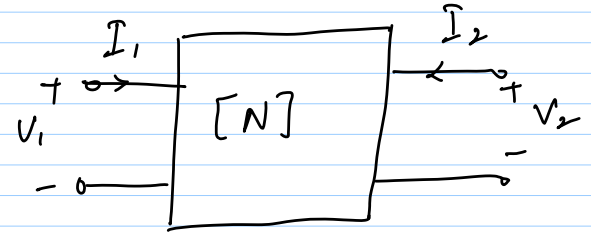
lec3

1/8/14

* Review of inL ckts
* 2-ports w/ NL elements



$$[I] = [Y][V]$$

$$I_1 = f_1(V_1, V_2)$$
$$I_2 = f_2(V_1, V_2)$$

Use a 2-D Taylor Series

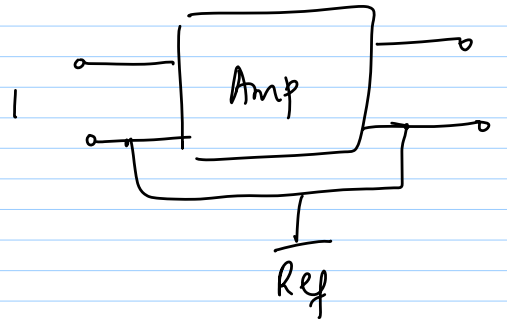
$$I_1 + i_1 = I_1 + \frac{\partial f_1}{\partial V_1} \cdot v_1 + \frac{\partial f_1}{\partial V_2} \cdot v_2$$

$$I_2 + i_2 = I_2 + \frac{\partial f_2}{\partial V_1} \cdot v_1 + \frac{\partial f_2}{\partial V_2} \cdot v_2$$

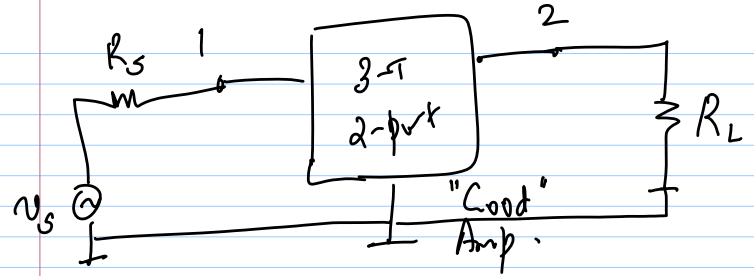
$$\begin{bmatrix} i_1 \\ i_2 \end{bmatrix} = \begin{bmatrix} \partial f_1/\partial V_1 & \partial f_1/\partial V_2 \\ \partial f_2/\partial V_1 & \partial f_2/\partial V_2 \end{bmatrix} \begin{bmatrix} v_1 \\ v_2 \end{bmatrix}$$

$$[i] = [y][v]$$

$$\begin{bmatrix} y_{11} & y_{12} \\ y_{21} & y_{22} \end{bmatrix}$$

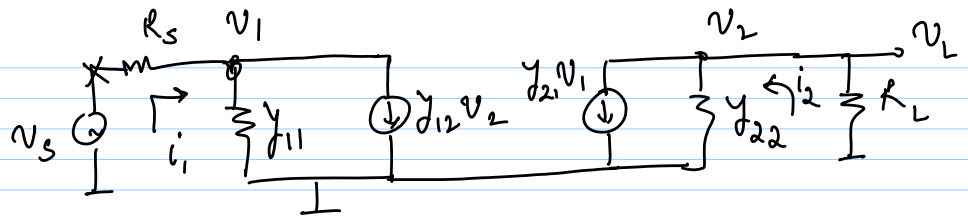


3-T
2-port

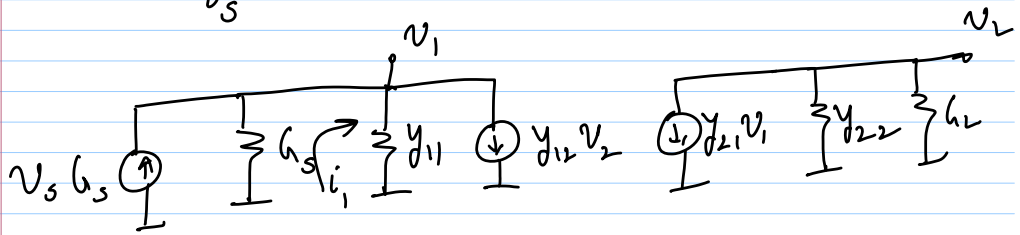


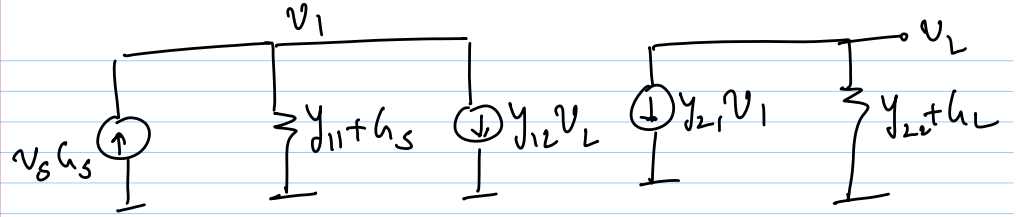
1) Gain should not depend on R_S
2) " " " " " R_L
3) High gain

→ Implications on $[y] = \begin{bmatrix} y_{11} & y_{12} \\ y_{21} & y_{22} \end{bmatrix}$



$$\frac{v_L}{v_s} = ?$$





KCL @ input:

$$v_s \cdot G_s = v_1 \left[y_{11} + G_s \right] + y_{12} v_L$$

KCL @ output:

$$v_L \cdot \left[y_{22} + G_L \right] + y_{21} v_1 = 0$$

$$v_1 = \frac{v_s G_s - y_{12} v_L}{y_{11} + G_s}$$

$$\frac{v_L}{v_s} = ?$$

$$v_L \left[y_{22} + G_L \right] + \frac{y_{21} \left(v_s G_s - y_{12} v_L \right)}{y_{11} + G_s} = 0$$