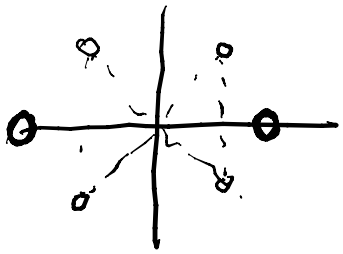
EE 610
10/13/11

Note Title 10/10/2011

Ex: $y(\alpha) = \dfrac{\alpha(\alpha^2+4)}{(\alpha^2+1)}$; $\delta[y] = 3$



$2\mathcal{E}y(\alpha) = y(\alpha) + y(-\alpha) \equiv 0$

Choose $k = 3$ $\quad y(k) = \dfrac{3(9+4)}{(9+1)} = \dfrac{39}{10}$

$$\frac{y_1(\alpha)}{y(k)} = \frac{k\,y(k) - \alpha\,y(\alpha)}{k\,y(\alpha) - \alpha\,y(k)}$$

we know $\alpha - 3$ cancels as does $\alpha + 3$
$\Rightarrow$ $\alpha^2 - 9$ factors

$\delta[y_1(\alpha)] = \delta[y] - 2 = 2$

$$\frac{y_1(\alpha)}{39/10} = \frac{3\left(\frac{39}{10}\right) - \alpha\left(\frac{\alpha(\alpha^2+4)}{\alpha^2+1}\right)}{3\left(\frac{\alpha(\alpha^2+4)}{\alpha^2+1}\right) - \alpha\left(\frac{39}{10}\right)} = \frac{\frac{117}{10}(\alpha^2+1) - \alpha^4 - 4\alpha^2}{3\alpha^3 + 12\alpha - \frac{39}{10}\alpha(\alpha^2+1)}$$

$$= \frac{-10\alpha^4 + 77\alpha^2 + 117}{-9\alpha^3 + 81\alpha}$$

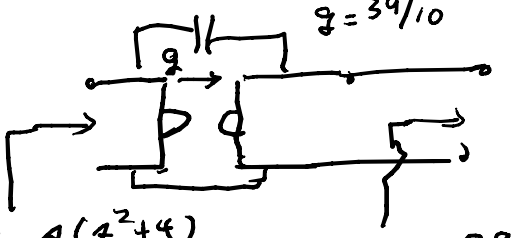
$\alpha^2 - 9$ factors?

$$\begin{array}{r|l} & -9\alpha \\ \hline \alpha^2 - 9 & -9\alpha^3 + 81\alpha \\ & -9\alpha^3 + 81\alpha \\ \hline & 0 \end{array}$$

$$\begin{array}{r|l} & -10\alpha^2 - 13 \\ \hline \alpha^2 - 9 & -10\alpha^4 + 77\alpha^2 + 117 \\ & -10\alpha^4 + 90\alpha^2 \\ \hline & -13\alpha^2 + 117 \\ & -13\alpha^2 + 117 \\ \hline & 0 \end{array}$$

$$\frac{y_2(\alpha)}{39/10} = \frac{(\alpha^2-9)(-10\alpha^2-13)}{(\alpha^2-9)(-9\alpha)} = \frac{10\alpha^2+13}{9\alpha}$$ in LPR ; $g = y(k)$, $c = y(k)/k$

$c = 13/10$ $\quad g = 39/10$



$y = \dfrac{\alpha(\alpha^2+4)}{\alpha^2+1}$ $\quad y_2(\alpha) = \dfrac{39}{10} \times \dfrac{10\alpha^2+13}{9\alpha}$ $\quad y_2(1) = \dfrac{39}{10} \times \dfrac{23}{14} \times \dfrac{1}{9} = \dfrac{13 \times 23}{30}$

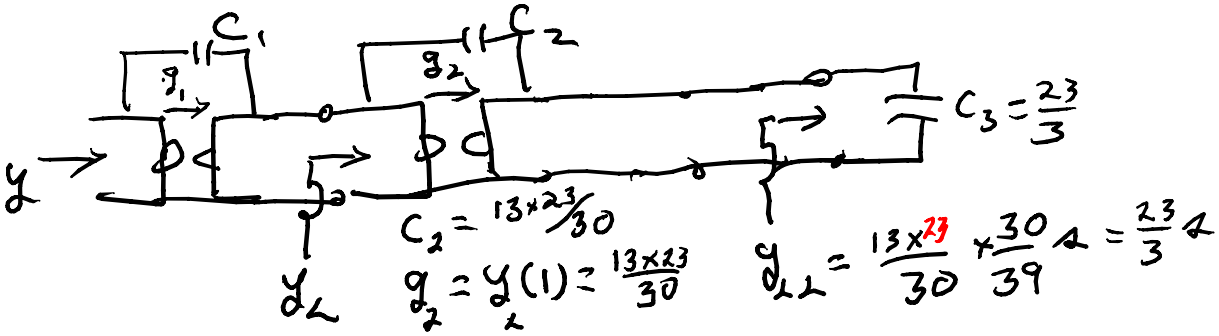
$\delta[y] = 3$ $\quad \delta[y_2] = 2$

Choose $k = 1$, $\dfrac{y_{LL}}{y_2(1)} = \dfrac{1 \cdot \frac{13 \times 23}{30} - \alpha\left(\frac{39}{10} \times \frac{10\alpha^2+13}{9\alpha}\right)}{1 \cdot \frac{39}{10}\left(\frac{10\alpha^2+13}{9\alpha}\right) - \frac{13 \times 23}{30} \cdot \alpha} = \dfrac{13 \times 23 \times 9\alpha - 3(39)(\alpha^2+13)}{3 \times 39(\alpha^2+13) - 13 \times 23 \times 9\alpha^2}$

$(\alpha^2-1) = (\alpha+1)(\alpha-1)$ divides

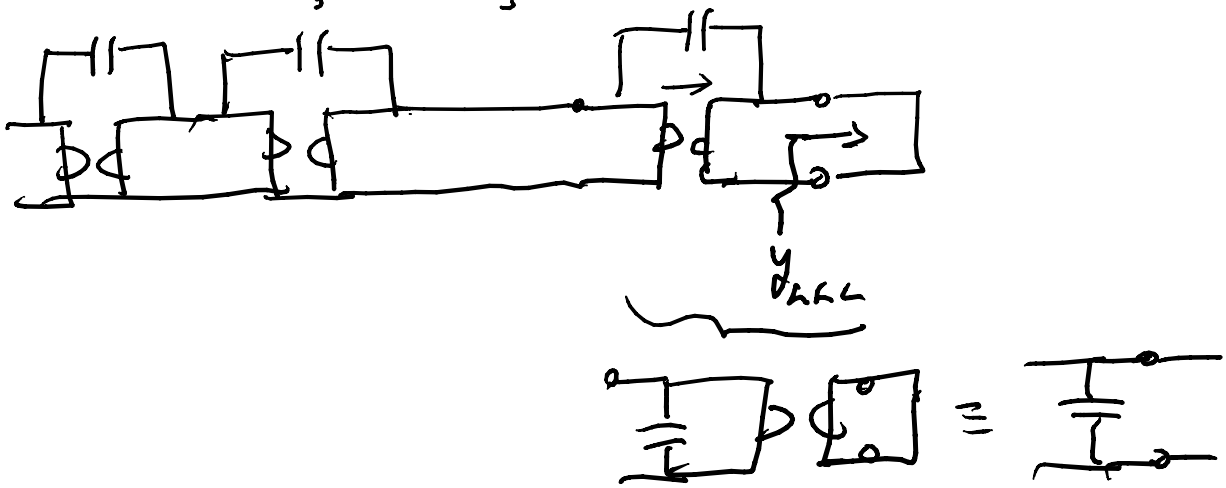
$$\frac{y_{LL}}{\frac{13\times 23}{30}} = \frac{-30\times 39\,s^3 - 39^2 s + 39\times 69\, s}{3\times 39\times 10\, s^2 + 39^2 - 39\times 69\, s^2} = \frac{39}{39}\,\frac{[-30s^3 + 30\, s]}{-39s^2 + 39}$$

$$= \frac{30}{39}\, s \qquad \delta[y_{LL}] = 1 = \delta[y_L] + 1$$



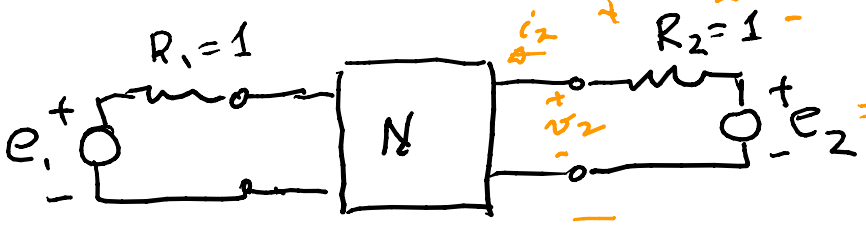
y_{LLL} choose $k = 1$; $y_{LL}(1) = \frac{23}{3}$

$$\frac{y_{LLL}}{23/3} = \frac{\frac{1\cdot\frac{23}{3}}{}}{1\cdot\frac{23}{3}s - s\frac{23}{3}} - s\times\frac{23}{3}\times s \approx \infty \Rightarrow y = \infty \Rightarrow z = 0$$



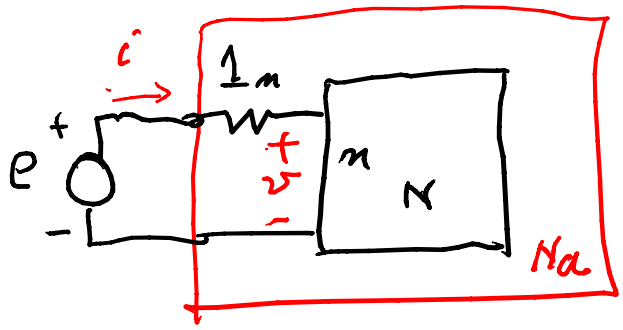
Can do with complex k if use k^* on y_L then get PR for y_{LL}

Move to scattering matrices (passive $\Rightarrow$ PR for $Y \& Z$ $\Rightarrow$ BR for S ↑ bounded



$$2v_2' = v_2 - i_2' = v_2 - (-i_2) = 2v_2$$

$$v_2' = v_2$$



$e = v + \hat{R} i = 2v^i$; v^i = incident voltage

$v - \hat{R} i = 2v^n$; v^n = reflected voltage

define the scattering matrix as $\overset{S}{\nabla\!\!\!\wedge}$

$$v^n = S v^i$$