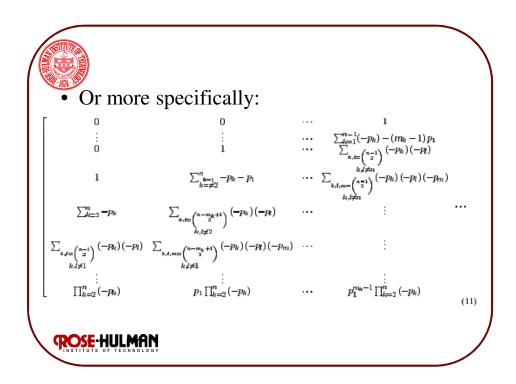
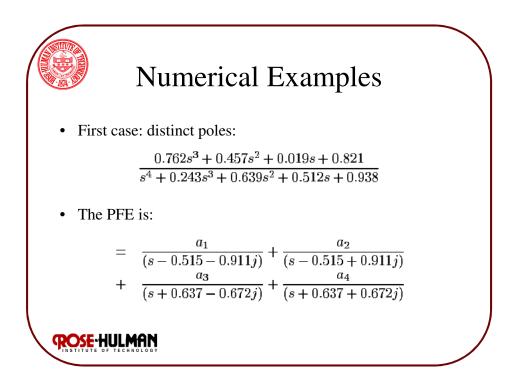
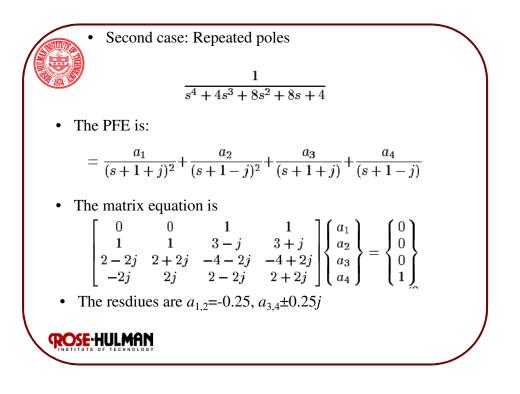


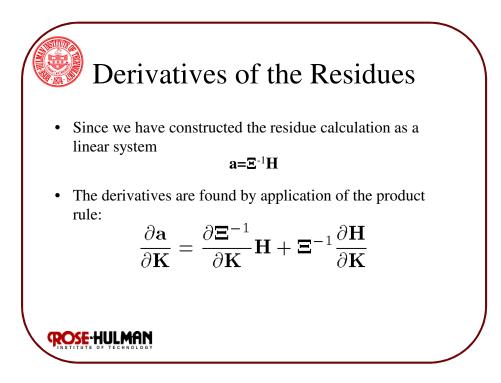
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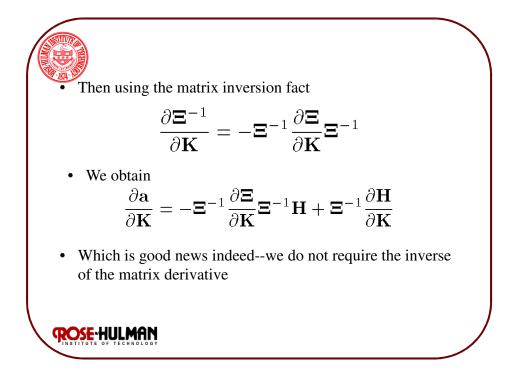




• The matrix equation is $\begin{bmatrix} \xi_1 & \xi_1^{\dagger} & \xi_2 & \xi_2^{\dagger} \end{bmatrix} \begin{cases} a_1 \\ a_2 \\ a_3 \\ a_4 \\ \end{bmatrix} = \begin{cases} 0.762 \\ 0.457 \\ 0.019 \\ 0.821 \\ \end{bmatrix}$ • Where $\xi_1 = \begin{bmatrix} 1 & .758 + .911j & .2 + 1.16j & -.441 + .78j \end{bmatrix}^T, \\ \xi_2 = \begin{bmatrix} 1 & .394 + .672j & -.439 - .692j & .697 + .735j \end{bmatrix}^T$ • The residues are $a_{1,2}$ =0.107±0.063j, $a_{3,4}$ =0.274±0.296j





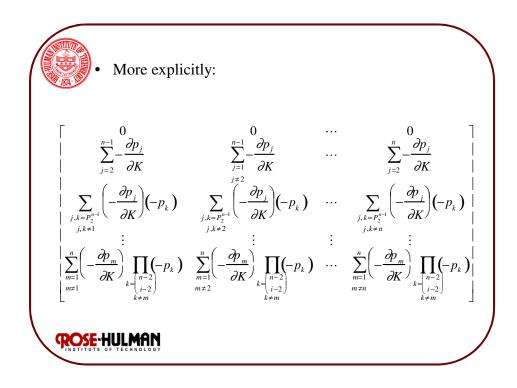


For the distinct poles case, the matrix derivative follows from the original pattern

\$\frac{\partial \Sigma_{i,j}}{\partial K} = \sum_{m=j}^n \left(-\frac{\partial p_m}{\partial K}\right) \sum_{k=\begin{pmatrix}n=2\\i=2\\i=2\\k\neq m\end{pmatrix}} - p_k \right)

In Matlab code, if
\$\sigma rows = combnk (-poles ([1:j-1, j+1:n]),k);
\$\sigma column = fliplr(-dpoles (1:j-1, j+1:n]);

Then
\$\sigma dXi = sum (prod (combnk (rows (m, :), k-1), column (:), 2));



Numerical Example
Considering the Frequency domain function
$\frac{.406s^4 + .936s^3 + .917s^2 + 0.41s + 0.894}{s^5 + 1.38s^4 + 1.78s^3 + 2.073s^2 + 1.66s + .396}$
• Assuming the pole derivatives are known as
$ \left\{ \begin{array}{c} \partial p_{1,2}/\partial K\\ \partial p_{3,4}/\partial K\\ \partial p_5/\partial K \end{array} \right\} = \left\{ \begin{array}{c} .0765 \mp 0.139i\\ .657 \mp .108i\\ -1.466 \end{array} \right\} $
• The derivative matrix is
$rac{\partial oldsymbol{\Xi}}{\partial oldsymbol{\mathrm{K}}} = \left[egin{array}{cccc} \xi_1 & \xi_1^\dagger & \xi_2 & \xi_2^\dagger & \xi_3 \end{array} ight]$
ROSE-HULMAN

