

$$sI - A = \begin{bmatrix} s & -1 & 0 \\ -1 & s & 0 \\ 0 & 0 & s+1 \end{bmatrix} \quad \det(sI - A) = (s+1) \det \begin{bmatrix} s & -1 \\ -1 & s \end{bmatrix}$$

$$= (s+1)(s^2 - 1) = (s+1)^2 (s-1)$$

$$(sI - A)^{-1} = \frac{1}{(s+1)^2 (s-1)} \begin{bmatrix} s/\cancel{s+1} & \cancel{s+1} & 0 \\ \cancel{s+1} & s/\cancel{s+1} & 0 \\ 0 & 0 & \cancel{s+1}/(s-1) \end{bmatrix}$$

$$Y(s) = \frac{1}{(s+1)^2 (s-1)} \begin{bmatrix} s/\cancel{s+1} & \cancel{s+1} & \cancel{s+1}/(s-1) \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} + \left(\frac{1}{(s+1)^2 (s-1)} \begin{bmatrix} s/\cancel{s+1} & \cancel{s+1} & \cancel{s+1}/(s-1) \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} + 1 \right)$$

$$= \frac{a s/\cancel{s+1} + b \cancel{s+1} + c \cancel{s+1}/(s-1)}{(s+1)^2 (s-1)} + \left(\frac{s/\cancel{s+1} + \cancel{s+1}/(s-1) + 1}{(s+1)^2 (s-1)} \right) \cup (s)$$

N.B. $s^2 - 1 = (s+1)(s-1)$
