



### Example 7-3: Zeros of System Function

Consider the FIR filter

$$y[n] = 6x[n] - 5x[n - 1] + x[n - 2]$$

The  $z$ -transform system function is

$$\begin{aligned} H(z) &= 6 - 5z^{-1} + z^{-2} \\ &= (3 - z^{-1})(2 - z^{-1}) = 6 \frac{(z - \frac{1}{3})(z - \frac{1}{2})}{z^2} \end{aligned}$$

Thus, the zeros of  $H(z)$  are  $\frac{1}{3}$  and  $\frac{1}{2}$ . Note that the filter

$$w[n] = x[n] - \frac{5}{6}x[n - 1] + \frac{1}{6}x[n - 2]$$

has a system function with the same zeros, but the overall constant is 1 rather than 6. This simply means that  $w[n] = y[n]/6$ . ■