

Example 10-14: The following $H(z)$ has two poles and two zeros.

$$H(z) = \frac{2 + 2z^{-1}}{1 - z^{-1} + z^{-2}} = 2 \frac{z^2 + z}{z^2 - z + 1}$$

The system function can be written in factored form as either of the two forms

$$H(z) = \frac{2z(z + 1)}{(z - e^{j\pi/3})(z - e^{-j\pi/3})} \quad (10.9a)$$

$$= \frac{2(1 + z^{-1})}{(1 - e^{j\pi/3}z^{-1})(1 - e^{-j\pi/3}z^{-1})} \quad (10.9b)$$

In the form (10.9a), it is easy to see that the poles $\{p_1, p_2\}$ and zeros $\{z_1, z_2\}$ are

$$p_1 = \frac{1}{2} + j\frac{1}{2}\sqrt{3} = e^{j\pi/3}$$

$$p_2 = \frac{1}{2} - j\frac{1}{2}\sqrt{3} = e^{-j\pi/3}$$

$$z_1 = 0$$

$$z_2 = -1$$

The poles and zeros are plotted in Fig. ??.

