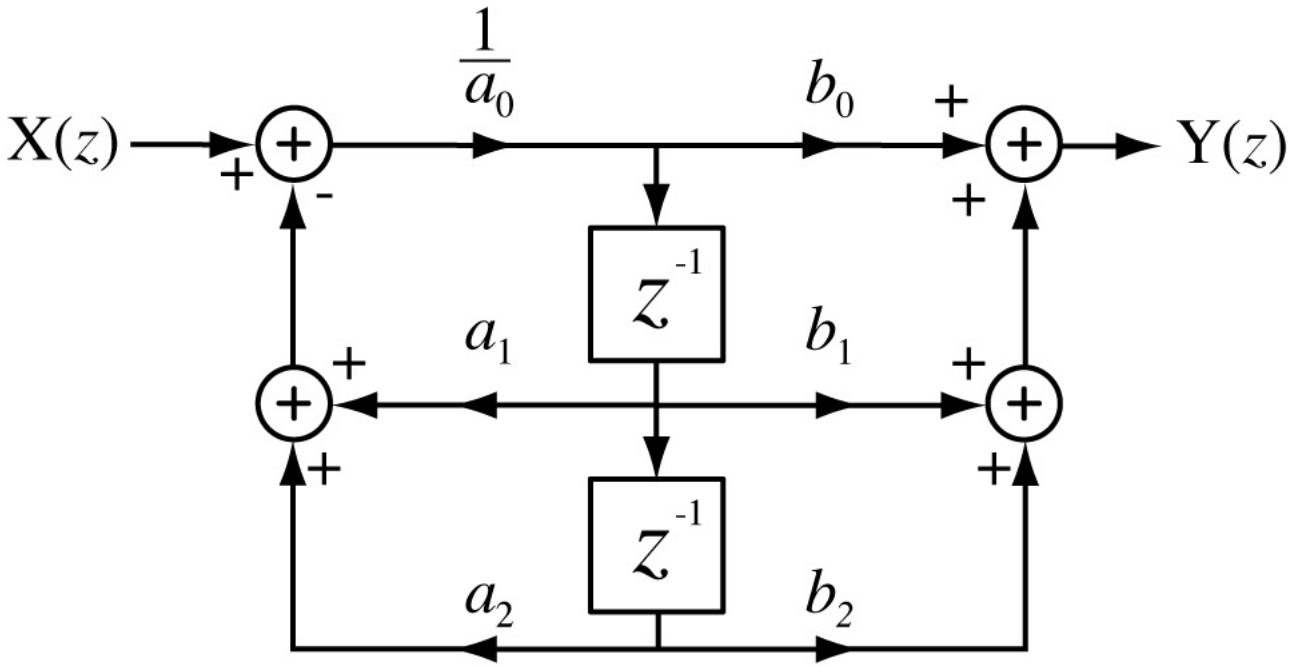
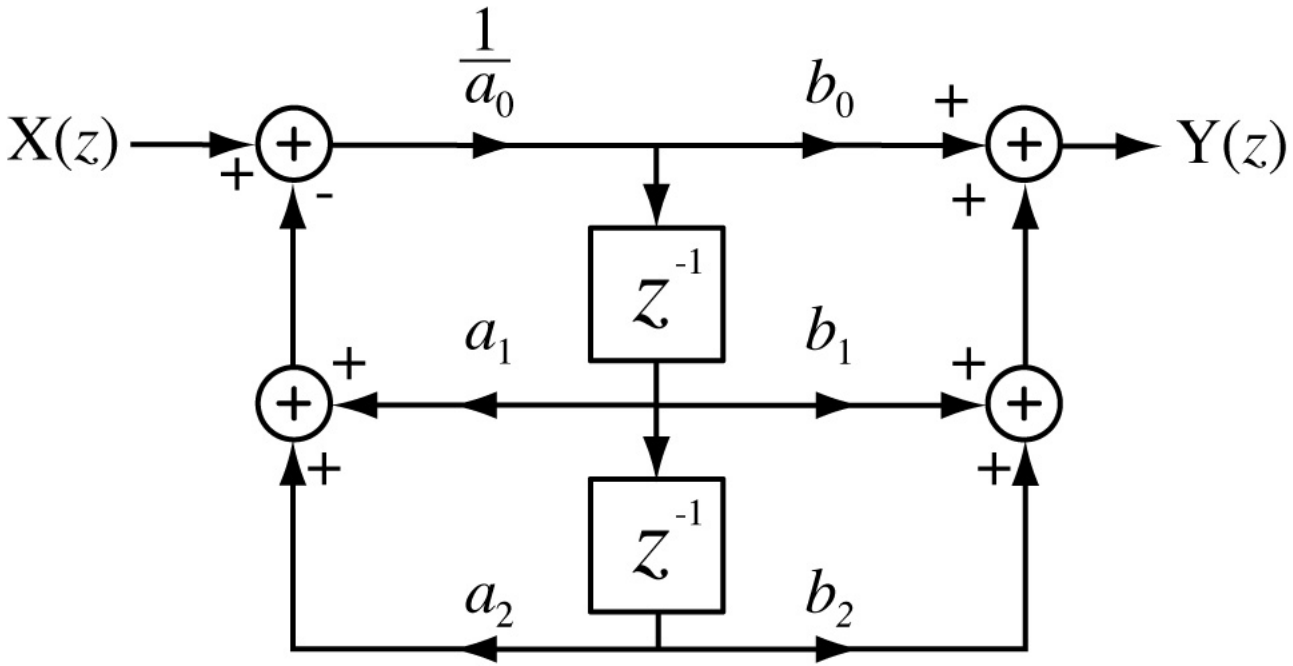


Let $a_0 = 1$, $a_1 = -0.7936$, $a_2 = 0.7265$

$b_0 = 0$, $b_1 = 0.1367$, $b_2 = -0.1367$

and graph the frequency response and unit sequence response of this digital filter.



$$\mathrm{H}(z) = \frac{0.1367z - 0.1367}{z^2 - 0.7936z + 0.7625} \leftarrow \text{Transfer Function}$$

$$\mathrm{H}\left(e^{j\Omega}\right) = \frac{0.1367e^{j\Omega} - 0.1367}{e^{j2\Omega} - 0.7936e^{j\Omega} + 0.7625} \leftarrow \text{Frequency Response}$$

$$H_{-1}(z) = \frac{z}{z-1} H(z) \leftarrow z \text{ Transform of the Unit-Sequence Response}$$

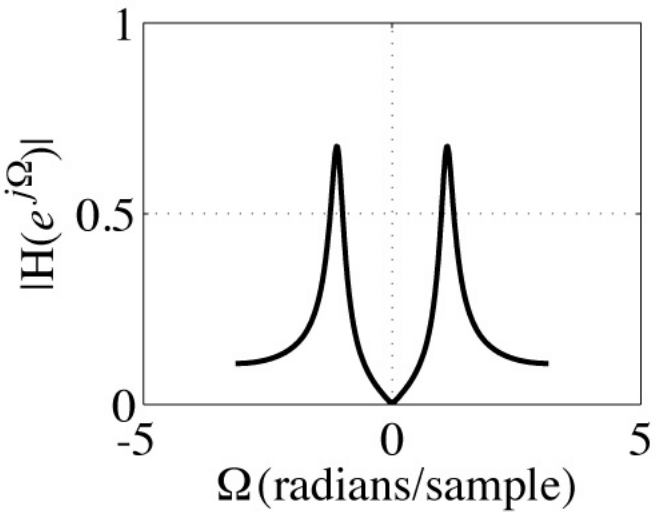
$$H_{-1}(z) = \frac{z}{z-1} \frac{0.1367(z-1)}{z^2 - 0.7936z + 0.7625} = \frac{0.1367z}{z^2 - 0.7936z + 0.7625}$$

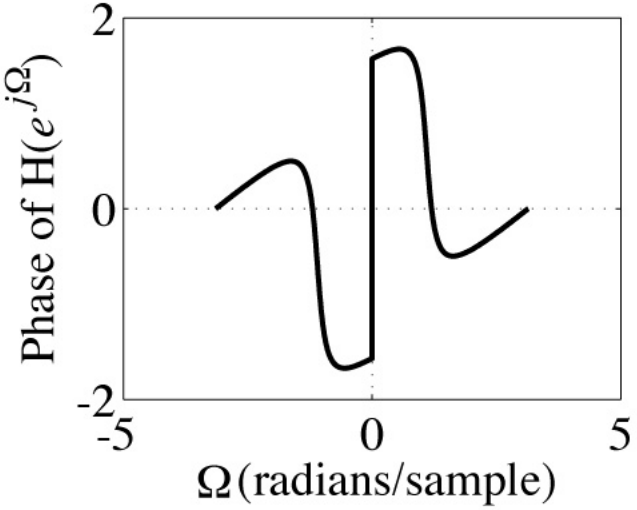
$$H_{-1}(z) = \frac{0.1367}{\alpha \sin(\Omega_0)} \frac{\alpha \sin(\Omega_0) z}{z^2 - 2\alpha \cos(\Omega_0) z + \alpha^2}$$

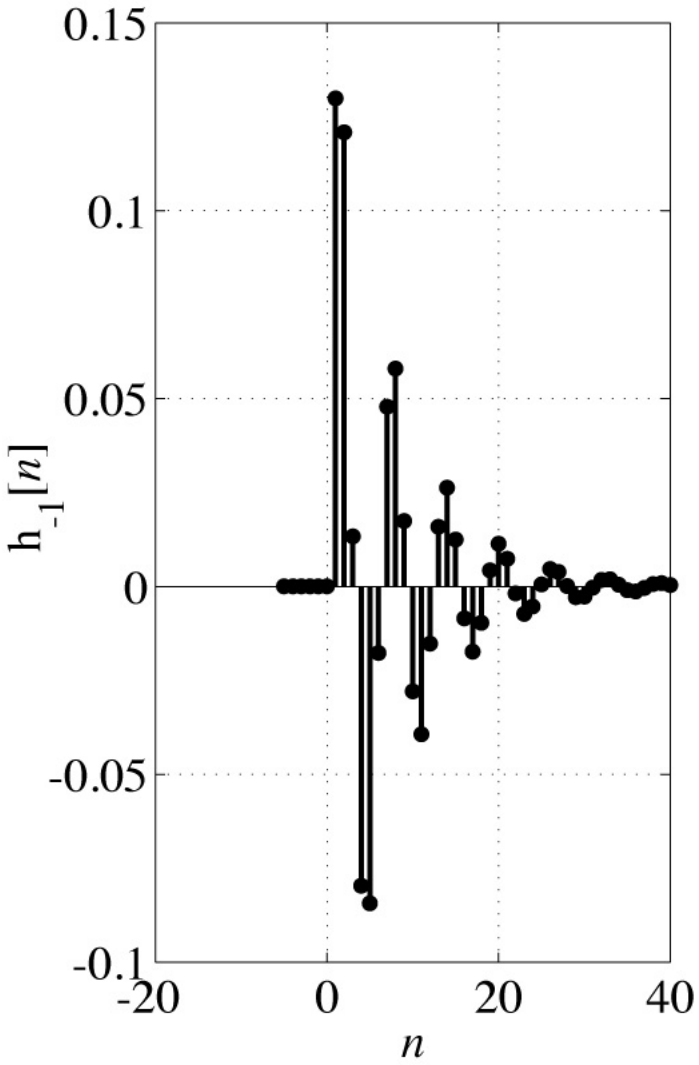
where $\alpha = \sqrt{0.7625} = 0.8732$, $2\alpha \cos(\Omega_0) = 0.7936 \Rightarrow \Omega_0 = 1.0991$

$$H_{-1}(z) = 0.1757 \frac{0.7778z}{z^2 - 0.7936 + 0.7625}$$

$$h_{-1}[n] = 0.1757(0.8732)^n \sin(1.0991n) u[n] \leftarrow \text{Unit-Sequence Response}$$


1
0.5
0
-5
0
5
|H(e^jΩ)|
Ω (radians/sample)


2
0
-2
-5
0
5
Phase of H(e^jΩ)
Ω (radians/sample)


0.15
0.1
0.05
0
-0.05
-0.1
-20
0
20
40
h_-1[n]
n