1. An LTI system has impulse response

$$h(n) = 5\,\delta(n) + 2\,\delta(n-1) - 3\,\delta(n-2).$$

Write a difference equation to implement the system.

2. An LTI system has impulse response

$$h(n) = 2\left(\frac{1}{3}\right)^n u(n) - u(n)$$

Write a difference equation to implement the system.
Is the system stable?

3. A causal LTI system is implemented by the difference equation

$$y(n) = 2\,x(n) + \frac{5}{6}\,y(n-1) - \frac{1}{6}\,y(n-2).$$

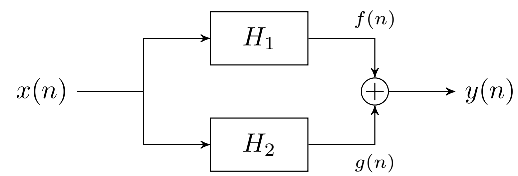
(a) Find the transfer function $H(z)$.
(b) Find the impulse response $h(n)$.
(c) Is the system stable?
(d) Find and sketch the impulse response $g(n)$ of the stable inverse system.

4. An LTI system has impulse response

$$h(n) = \delta(n) - \frac{7}{2}\,\delta(n-1) + 3\,\delta(n-2).$$

Find the impulse response $g(n)$ of the stable inverse system.
Accurately sketch $g(n)$ for $-3 \le n \le 3$.

5. Two causal LTI systems are combined in parallel:



The two systems are implemented with difference equations:

$$H_1: \quad f(n) = \frac{1}{2}\,x(n) + \frac{1}{2}\,x(n-1)$$

$$H_2: \quad g(n) = 2\,x(n) - \frac{1}{2}\,g(n-1)$$

Find the difference equation describing the total system between input $x(n)$ and output $y(n)$.