

BIOE 1410 Homework 3

- ① Find all non-zero terms a_k for the Fourier Series of

$$x(t) = 3 + 3\cos(2t) - \sin(2t) + \sin(4t)$$

what is the fundamental frequency ω_0 ?

- ② Find all non-zero terms a_k for the Fourier Series of

$$x(t) = \sin(6t + \pi/3) - \cos(0t)$$

- ③ If $a_0 = 2$, $a_1 = 1+j$, $a_{-1} = 1-j$,

what is $x(t) \xleftrightarrow{F_s} a_k$?

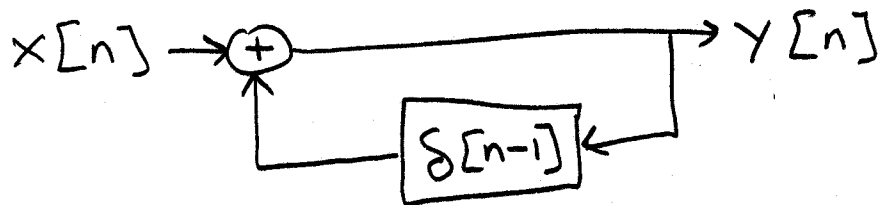
- ④ Explain the negative sign in

$$a_k = \frac{1}{T_0} \int_{T_0} x(t) e^{-jk\omega_0 t} dt$$

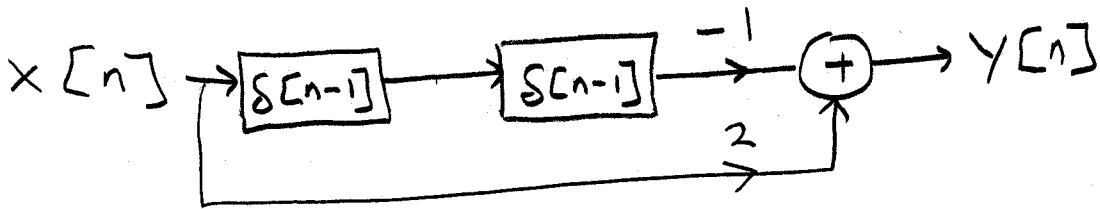
Prove that a_0 is the average value of $x(t)$

For each of the following systems, state whether it has memory, is causal, has a FIR or IIR, and compute the impulse response, $h[n]$.

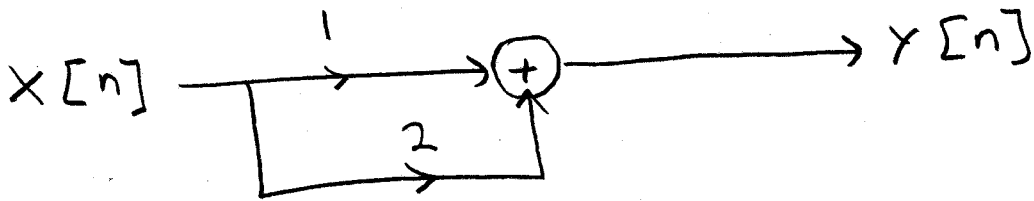
⑤



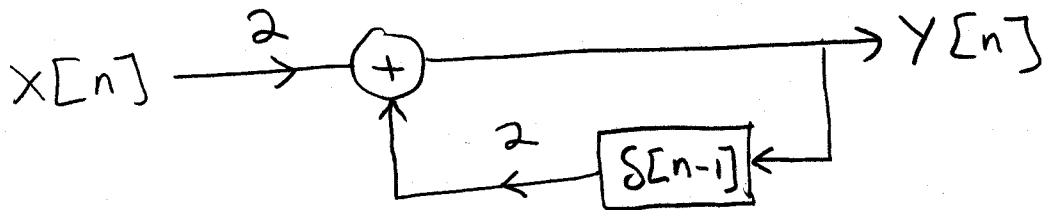
⑥



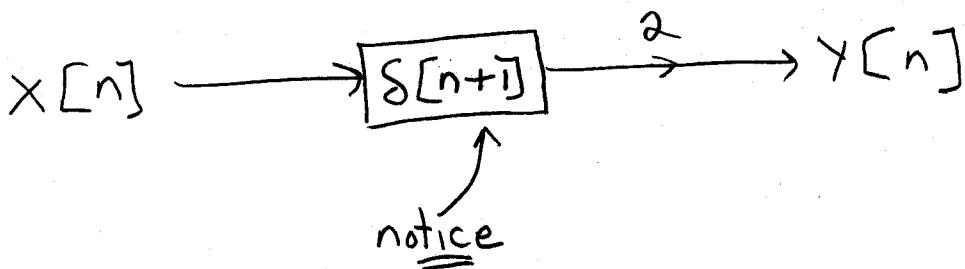
⑦



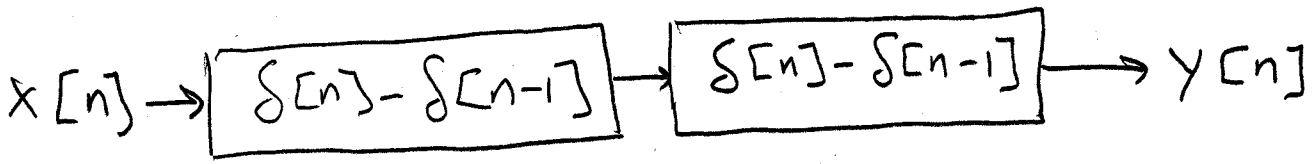
⑧



⑨

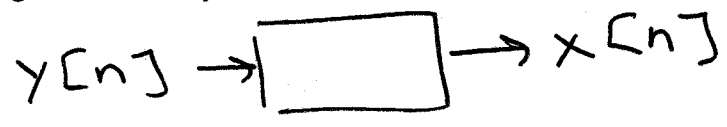


⑩ what is the impulse response of the following system?



⑪ For the system in ⑩, how would you describe it in terms of derivatives?

⑫ For the system in ⑩, find the inverse system, such that



⑬ What is the impulse response of the system in ⑫?

⑭ Find the even and odd parts of the signal,
The signal,

$$x[n] = u[n] \cdot n$$

sketch $x[n]$, $\text{Ev}\{x[n]\}$, $\text{Od}\{x[n]\}$

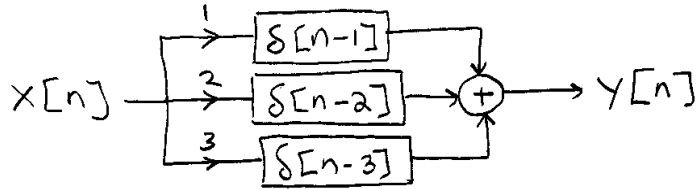
⑮ Find the even and odd parts of the signal,

$$x(t) = e^t$$

sketch e^t , $\text{Ev}\{e^t\}$, $\text{Od}\{e^t\}$

16. For this system diagram, write the system equation, sketch the impulse response, and write an equation for the impulse response. Is it Finite Impulse Resonse (FIR) or Infinite Impulse Response (IIR)?

A.



B.

