$y[n] = \frac{A}{2}e^{j\phi}H(e^{j\hat{\omega}})e^{j\hat{\omega}n} + \frac{A}{2}e^{-j\phi}H(e^{-j\hat{\omega}})e^{-j\hat{\omega}n}$

$= 2\,\mathrm{Re}\left(\frac{A}{2}e^{j\phi}H(e^{j\hat{\omega}})e^{j\hat{\omega}n}\right)$

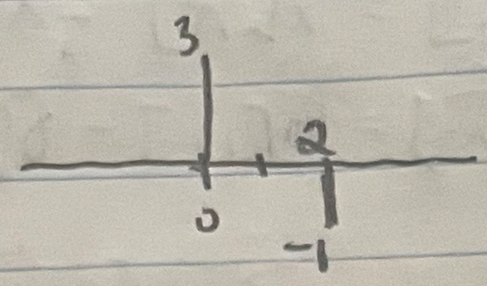
$= A|H(e^{j\hat{\omega}})|\cos(\hat{\omega}n + \phi + \angle H(e^{j\hat{\omega}}))$

WS Thurs

6.7a) $H(e^{j\omega}) = 3 - e^{-j2\omega}$

$3e^{j0\omega} - 1e^{-2\omega}$

↑ $h[0]$ ↑ $h[2]$




$h[n] = 3\delta[n] - 1\delta[n-2]$

b) $H(e^{j\omega}) = 5e^{-j3\omega}\cos(2\hat{\omega})$

$= 5e^{-j3\omega}\frac{e^{j2\omega} + e^{-j2\omega}}{2} = \frac{1}{2}\left(5e^{-j\omega} + 5e^{-j5\omega}\right) = \frac{5}{2}e^{-j\omega} + \frac{5}{2}e^{-j5\omega}$

↑ $h[1]$ ↑ $h[5]$

c) $H(e^{j\hat{\omega}}) = e^{-j5.5\omega}\frac{\sin(5\hat{\omega})}{\sin(\hat{\omega}/2)} \rightarrow h[n] = u[n] - u[n-L]$

6.9 $H(e^{j\hat{\omega}}) = (1 + e^{-j2\omega})(1 - \frac{1}{2}e^{-j\hat{\omega}} + \frac{1}{4}e^{-j2\omega})$

a. $x[n] = Ae^{j\phi}e^{j\hat{\omega}_0 n} \longrightarrow \boxed{H(e^{j\omega})} \longrightarrow y[n] = Ae^{j\phi}(H(e^{j\omega_0}))e^{j\hat{\omega}_0 n}$

a. $H(e^{j\hat{\omega}}) = \underbrace{(1 + e^{-j2\omega})}_{-1}\underbrace{(1 - \frac{1}{2}e^{-j\omega} + \frac{1}{4}e^{-j2\omega})}_{0}$

$\omega = \pm\pi = 2\omega$

$\omega = \pm\frac{\pi}{2}$

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{\frac{1}{2} \pm \sqrt{\frac{1}{4} - 4(\frac{1}{4})1}}{2(\frac{1}{4})}$

$= 1 \pm j\sqrt{3} = 2e^{\pm\frac{\pi}{3}}$

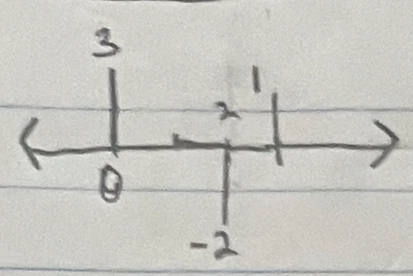
$\Rightarrow$ for $\omega = \pm\frac{\pi}{2}$, $y[n] = 0$ for all $n$.

Week 5 Thursday
6.16 will be similar to exam

$x[n] = 2 + \cos(\frac{\pi}{4}n) + \cos(\frac{3\pi}{4}n + \frac{\pi}{2})$

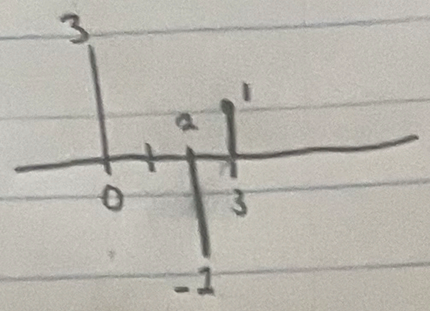
$y[n] = 0 + \cos(\frac{\pi}{4}n) + \frac{1}{10}\cos(\frac{3\pi}{4}n - \pi)$

6.10 a




b. $x[n] = 3\delta[n] - 2\delta[n-2] + \delta[n-3]$

$h[n] = \delta[n] - \delta[n-3]$




$n=0 \Rightarrow 3(1) = 3$

$n=1 \Rightarrow 0$

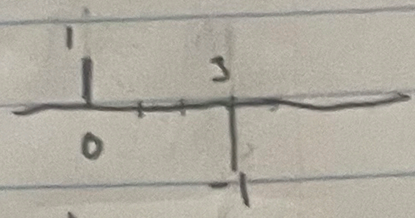
$n=2 \Rightarrow -2(1) = -2$

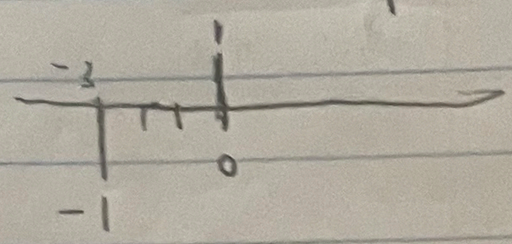
$n=3 \Rightarrow (1)(1) + 3(-1) = -2$

$n=4 \Rightarrow 0$

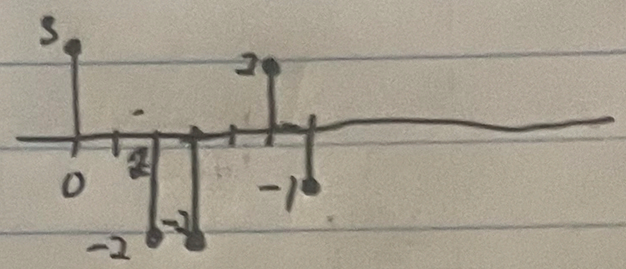
$n=5 \Rightarrow -2(-1) \Rightarrow 2$

$n=6 \Rightarrow 1(-1) \Rightarrow -1$



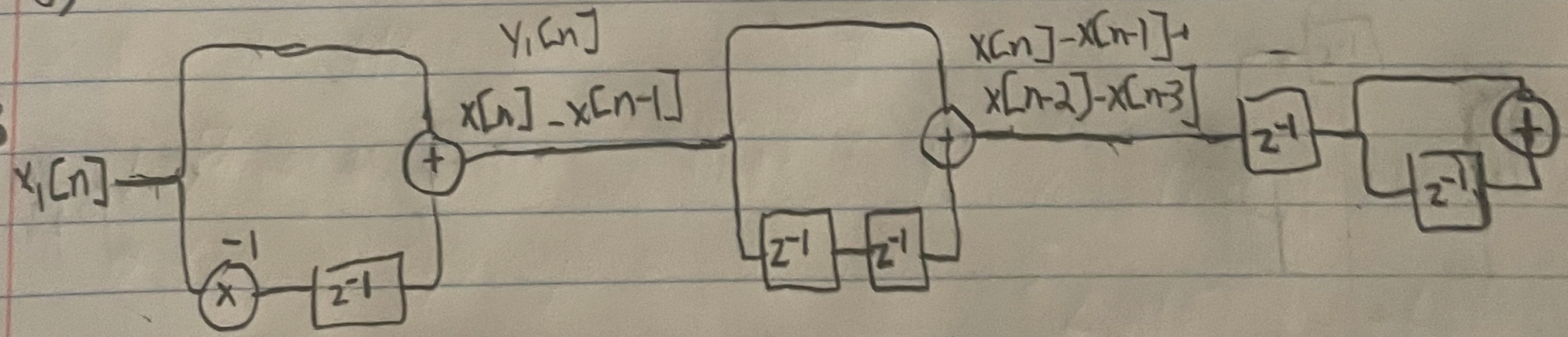

$y[n]$




c. $x[n] = \cos(\pi(n-3)/3) \rightarrow$ [LTI] $\rightarrow y[n] = 2\cos(\pi(n-3)/3)$

d)

6.13




$y[n] = x[n-1] - x[n-2] + x[n-3] - x[n-4]$
$+ x[n-2] - x[n-3] + x[n-4] - x[n-5]$
$= x[n-1] - x[n-5]$

6.16