5.23

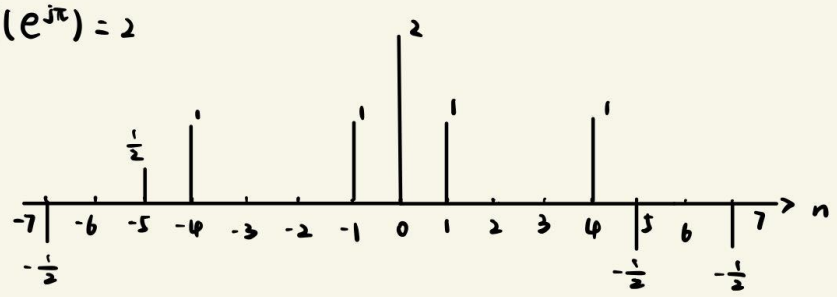
(a) $X(e^{j0}) = 6$

(b) $\angle X(e^{jw}) = e^{-j2w}$

(c) $\int_{-\pi}^{\pi} X(e^{jw})\,dw = 4\pi$

(d) $X(e^{j\pi}) = 2$

(e)



(f) (i) 28π

(ii) 36π

5.29

(a)

(i) $y[n] = [3(\frac{3}{4})^n - 2\left(\frac{1}{2}\right)^n]u[n]$

(ii) $y[n] = [4(\frac{1}{2})^n - 2\left(\frac{1}{4}\right)^n - (n+1)\left(\frac{1}{4}\right)^n]u[n]$

(iii) $y[n] = \frac{2}{3}(-1)^n$

(b)

Given

$$h[n] = \frac{1}{2}(\frac{1}{2}e^{j\pi/2})^n u[n] + \frac{1}{2}(\frac{1}{2}e^{-j\pi/2})^n u[n]$$

we obtain

$$H[e^{jw}] = \frac{1/2}{1-\frac{1}{2}e^{j\pi/2}e^{-jw}} + \frac{1/2}{1-\frac{1}{2}e^{-j\pi/2}e^{-jw}}$$

(i)

(i)We have

$$X(e^{jw}) = \frac{1}{1-\frac{1}{2}e^{-jw}}$$

Therefore

$$Y[e^{jw}] = [\frac{1/2}{1-\frac{1}{2}e^{j\pi/2}e^{-jw}} + \frac{1/2}{1-\frac{1}{2}e^{-j\pi/2}e^{-jw}}][\frac{1}{1-\frac{1}{2}e^{-jw}}]$$

$$= \frac{A}{1-\frac{1}{2}e^{j\pi/2}e^{-jw}} + \frac{B}{1-\frac{1}{2}e^{-jw}} + \frac{C}{1-\frac{1}{2}e^{-j\pi/2}e^{-jw}}$$

Where A=-j/[2(1-j)], B=1/2, and C= 1/[2(1+j)], therefore

$$y[n] = \frac{-j}{2(1-j)}(\frac{j}{2})^n u[n] + \frac{1}{2(1+j)}(-\frac{j}{2})^n u[n] + \frac{1}{2}(\frac{1}{2})^n u[n]$$

(ii)

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

5.33

(a)

$$H(e^{j\omega}) = \frac{Y(e^{j\omega})}{X(e^{j\omega})} = \frac{1}{1+\frac{1}{2}e^{-j\omega}}$$

(b)

(i)

$$y[n] = \frac{1}{2}\left(\frac{1}{2}\right)^n u[n] + \frac{1}{2}\left(-\frac{1}{2}\right)^n u[n]$$

(ii)

$$y[n] = (n+1)\left(-\frac{1}{2}\right)^n u[n]$$

(iii)

$$y[n] = \delta[n]$$

(iv)

$$y[n] = -\delta[n] + 2\left(-\frac{1}{2}\right)^n u[n]$$

(c)

(i)

$$Y(e^{j\omega}) = (n+1)\left(-\frac{1}{2}\right)^n u[n] - \frac{1}{4}n\left(-\frac{1}{2}\right)^{n-1} u[n-1]$$

(ii)

$$y[n] = \left(\frac{1}{4}\right)^n u[n]$$

(iii)

$$y[n] = \frac{2}{3}(n+1)\left(-\frac{1}{2}\right)^n u[n] + \frac{2}{9}\left(-\frac{1}{2}\right)^n u[n] + \frac{1}{9}\left(\frac{1}{4}\right)^n u[n]$$

(iv)

$$y[n] = \left(-\frac{1}{2}\right)^n u[n] + 2\left(-\frac{1}{2}\right)^{n-3} u[n-3]$$