$$H(e^{j\hat{\omega}}) = (1-e^{j\pi/2}z^{-1})(1-e^{-j\pi/2}z^{-1})(1+e^{j\hat{\omega}})$$

$$= (1-e^{j\pi/2}z^{-1} - e^{-j\pi/2}z^{-1} + z^{-2})(1+e^{j\hat{\omega}})$$

$$= (1-z^{-1}+z^{-2})(1+e^{j\hat{\omega}})$$

$$= (1-e^{-j\hat{\omega}}+e^{-j2\hat{\omega}})(1+e^{j\hat{\omega}})$$

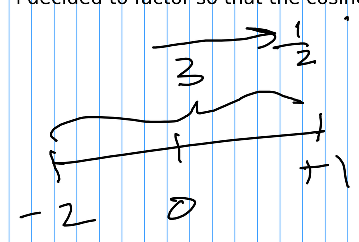
$$= (\cancel{1}+e^{j\hat{\omega}}-\cancel{e^{-j\hat{\omega}}}-\cancel{1}+e^{-j2\hat{\omega}}+\cancel{e^{-j\hat{\omega}}})$$

$$= (e^{j\hat{\omega}}+e^{-j2\hat{\omega}})$$

$$= (e^{\frac{3}{2}j\hat{\omega}}+e^{-j\frac{3}{2}\hat{\omega}})e^{-j\frac{1}{2}\hat{\omega}}$$

$$= \left(2\cos\left(\frac{3}{2}\hat{\omega}\right)\right)e^{-j\frac{1}{2}\hat{\omega}}$$

i decided to factor so that the cosine term could come out



- use superposition

$$x[n] = 5+20\cos(0.25\pi n + 0.25\pi)+\delta[n-3]$$

corrected at the end of the document

$$H(e^{j0}) = 2e^{-j0}$$

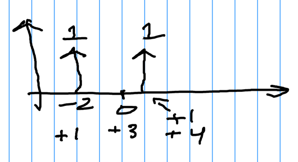
$$H(e^{j\pi/4}) = 2\cos\left(\frac{3\pi}{8}\right)e^{-j\frac{3\pi}{16}}$$

$$= 0.7656\, e^{-j3\pi/16}$$

resp due to $\delta[n-3]$

$$y[n] = 10+15.3\cos\left(0.25\pi n + \frac{7\pi}{16}\right) + \underbrace{(\quad)}_{}$$

$$y[n] = x[n+1]+x[n-2]$$



used the delta function and delayed by 3

$$\boxed{y[n] = 10+15.3\cos\left(0.25\pi n + \frac{7\pi}{16}\right) + \delta[n-1]+\delta[n+4]}$$

$$G = 10\log(4\pi A/\lambda^2) \quad = 20\log_{10}(2\pi r/\lambda)$$

$$A\pi r^2$$

$$10\log(4\pi(\pi r^2)/\lambda^2) = 20$$

$$G = 10\log(x^2) \quad = \quad 20\log(x)$$

$$G = 10\log(3^2 4^2) \quad = \quad 20\log(3^2 4)$$

just ignore this, i was helping someone understand log and exponent last night.

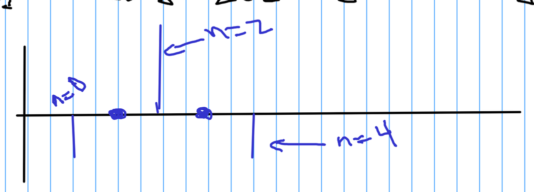
i love math and i try to do it as much as possible.

more solutions on the next page

$$y[n] = -x[n] + 2x[n-2] - x[n-4]$$

I. $x[n] = \delta[n]$ impulse response

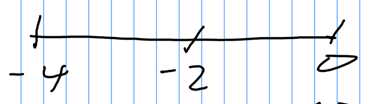
$$h[n] = -\delta[n] + 2\delta[n-2] - \delta[n-4]$$



II. $H(e^{j\hat{\omega}}) = \left(-1 + 2e^{-j2\hat{\omega}} - e^{-j4\hat{\omega}}\right)$

$$= R(e^{j\hat{\omega}})\, e^{-j\hat{\omega} n_0}$$

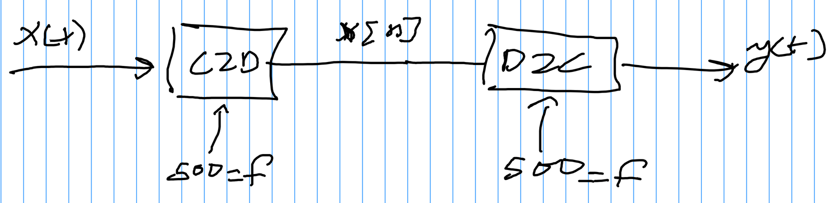
$$- \left(\boxed{2\cos(\hat{\omega}) = e^{+j\hat{\omega}} + e^{-j\hat{\omega}}} \right.$$

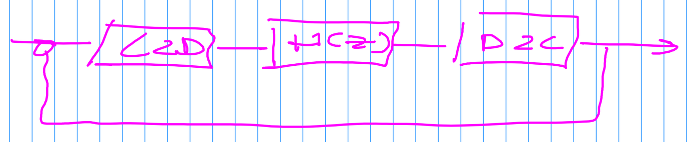


$$H(e^{j\hat{\omega}}) = \left(-1e^{j\hat{\omega}2} + 2 - e^{-j2\hat{\omega}}\right) e^{-j\hat{\omega}2}$$

$$\boxed{H(e^{j\hat{\omega}}) = \left(2 - 2\cos(2\hat{\omega})\right) e^{-j\hat{\omega}2}}$$

$$x(t) = 5\cos(200\pi t) + 10\cos\left(800\pi t + \frac{\pi}{3}\right) + 2\cos\left(2200\pi t + \frac{\pi}{6}\right)$$





$$x[n] = x(t)\Big|_{t=\frac{n}{f}}$$

$$x[n] = 5\cos\left(\frac{2\pi}{5}n\right) + 10\cos\left(1.6\pi n + \frac{\pi}{3}\right) + 2\cos\left(4.4\pi n + \frac{\pi}{6}\right)$$

$$x[n] = 5\cos(0.4\pi n) + 10\cos\left((2-0.4)\pi n + \frac{\pi}{3}\right) + 2\cos\left((4+0.4)\pi n + \frac{\pi}{6}\right)$$

$$x[n] = 5\cos(0.4\pi n) + 10\cos\left(-0.4\pi n + \frac{\pi}{3}\right) + 2\cos\left(0.4\pi n + \frac{\pi}{6}\right)$$

$$\cos(-\theta) = \cos(\theta)$$

$$x[n] = 5\cos(0.4\pi n) + 10\cos\left(0.4\pi n - \frac{\pi}{3}\right) + 2\cos\left(0.4\pi n + \frac{\pi}{6}\right)$$

$$x[n] = 5\angle 0 + 10\angle -\frac{\pi}{3} + 2\angle +\frac{\pi}{6}$$

$$x[n] = 5(\cos(0) + j\sin(0)) + 10\left(\cos\left(-\frac{\pi}{3}\right) + j\sin\left(-\frac{\pi}{3}\right)\right) + 2\left(\cos\left(\frac{\pi}{6}\right) + j\sin\left(+\frac{\pi}{6}\right)\right)$$

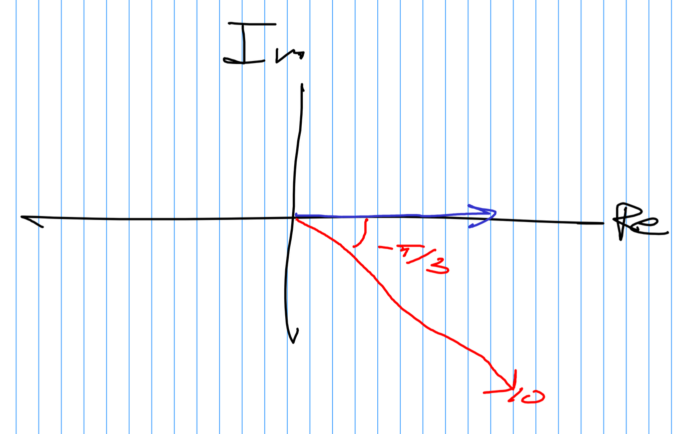
$$x[n] = (5 + j0) + (5 - j8.66) + (1.73 + j1)$$

$$x[n] = 11.73 - j7.66 \Rightarrow x[n] = \sqrt{11.73^2 + (-7.66)^2}\cos\left(0.4\pi n + \tan^{-1}\left(\frac{-7.66}{11.73}\right)\right)$$

$$\boxed{x[n] = 14.01\cos(0.4\pi n - 0.6784)}$$

$$y(t) = x[n]\Big|_{n=tf} = t500$$

$$\boxed{y(t) = 14.01\cos(200\pi t - 0.6784)}$$


Im
Re
-π/3
10

$$\left(e^{j\hat{\omega}}\right) = (1-e^{j\pi/2}z^{-1})(1-e^{-j\pi/2}z^{-1})(1+e^{j\hat{\omega}})$$

$$= \left(1 - e^{j\pi/2}z^{-1} - e^{-j\pi/2}z^{-1} + z^{-2}\right)$$

$$= \left(1 - z^{-1}\left(\underbrace{2\cos\left(\tfrac{\pi}{2}\right)}_{0}\right) + z^{-2}\right)$$

$$= \left(1+z^{-2}\right)\left(1+e^{j\hat{\omega}}\right)$$

$$1+e^{-j\hat{\omega}}$$

$$\left(1+e^{-j2\hat{\omega}}\right)\left(1+e^{j\hat{\omega}}\right)$$

$$= \left(1+e^{j\hat{\omega}} + e^{-j\hat{\omega}2} + e^{-j\hat{\omega}}\right)$$

$$= \left(e^{-2j\hat{\omega}} + e^{-j\hat{\omega}} + 1 + e^{j\hat{\omega}}\right)$$

$$= \left(e^{-j3\hat{\omega}} + e^{-2j\hat{\omega}} e^{-j\hat{\omega}} + 1\right)e^{+j\hat{\omega}}$$

Dirichlet Function with some offset

$$= \left[\frac{\sin(\hat{\omega}L/2)}{L\sin(\hat{\omega}/2)}\, e^{-j\hat{\omega}(L-1)/2}\right] e^{j\hat{\omega}}$$

$$H(e^{j\hat{\omega}}) \left[\frac{\sin(\hat{\omega}2)}{4\sin(\hat{\omega}/2)}\, e^{-j\frac{5}{2}\hat{\omega}}\right]$$

- use superposition

here are some inputs to my function.

$$x[n] = \underbrace{5}_{\hat{\omega}=0} + \underbrace{20\cos(0.25\pi n + 0.25\pi)}_{\hat{\omega}=\frac{\pi}{4}} + \delta[n-3]$$

$$H(e^{j0}) = \frac{\sin(0)}{4\sin(0)}\, e^{-j0} \longrightarrow \boxed{5}$$

$$= 1e^{-j0}$$

$$H(e^{j\frac{\pi}{4}}) = \frac{\sin\left(\frac{\pi}{2}\right)}{4\sin\left(\frac{\pi}{8}\right)}\, e^{-j\frac{5}{2}\frac{\pi}{4}}$$

$$= \frac{1}{4\cdot 0.3826}\, e^{-j\frac{5\pi}{8}}$$

$$= 0.654\, e^{-j\frac{5\pi}{8}} \longrightarrow 20(0.654)\cos\left(0.25\pi n + \frac{\pi}{4} - \frac{5\pi}{8}\right)$$

$$\boxed{13.08\cos\left(0.25\pi n - \frac{3\pi}{8}\right)}$$

to deal with the delta function i just deal with the difference equation

$$= \left(e^{-2j\hat{\omega}} + e^{-j\hat{\omega}} + 1 + e^{j\hat{\omega}}\right)$$

$$= \left(z + 1 + z^{-1} + z^{-2}\right)$$

$$= x[n+1] + x[n] + x[n-1] + x[n-2]$$

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

$$h[n] = \delta[n-2] + \delta[n-3] + \delta[n-4] + \delta[n-5]$$

add everything in the BLUE

$$y[n] = 5 + 13.08\cos\left(0.25\pi n - \frac{3\pi}{8}\right) + \delta[n-2] + \delta[n-3] + \delta[n-4] + \delta[n-5]$$

i think thats it.