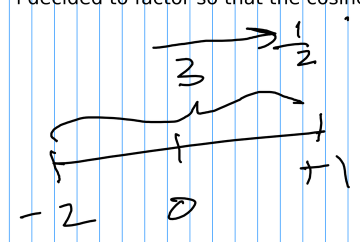
$$H(e^{j\hat{\omega}}) = (1-e^{j\pi/2}z^{-1})(1-e^{-j\pi/2}z^{-1})(1+e^{j\hat{\omega}})$$
$$= (1-e^{j\pi/2}z^{-1} - e^{-j\pi/2}z^{-1} + z^{-2})(1+e^{j\hat{\omega}})$$
$$= (1-z^{-1}+z^{-2})(1+e^{j\hat{\omega}})$$
$$= (1-e^{-j\hat{\omega}}+e^{-j2\hat{\omega}})(1+e^{j\hat{\omega}})$$
$$= (\cancel{1}+e^{j\hat{\omega}}\cancel{-e^{-j\hat{\omega}}}\cancel{-1}+e^{-j2\hat{\omega}}\cancel{+e^{-j\hat{\omega}}})$$
$$= (e^{j\hat{\omega}}+e^{-j2\hat{\omega}})$$
$$= (e^{\frac{3}{2}j\hat{\omega}}+e^{-j\frac{3}{2}\hat{\omega}})e^{-j\frac{1}{2}\hat{\omega}}$$
$$= \left(2\cos\left(\tfrac{3}{2}\hat{\omega}\right)\right)e^{-j\frac{1}{2}\hat{\omega}}$$

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



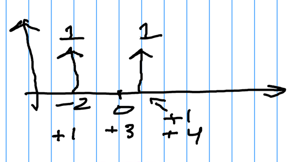
$$H(e^{j0}) = 2e^{-j0}$$
$$H(e^{j\pi/4}) = 2\cos\left(\frac{3\pi}{8}\right)e^{-j\frac{3\pi}{16}}$$
$$= 0.7656\,e^{-j3\pi/16}$$

· use superposition

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

$$y[n] = 10+15.3\cos\left(0.25\pi n+\frac{7\pi}{16}\right)+\underbrace{(\quad)}_{\text{resp due to } \delta[n-3]}$$

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



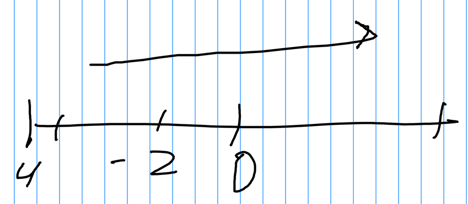
used the delta function and delayed by 3

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

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

find impulse response
$x[n] = \delta[n]$

$$h[n] = -\delta[n]+2\delta[n-2]-4\delta[n-4]$$
$$\Big\downarrow \mathcal{Z}$$
$$H(z) = -1+2z^{-2}-4z^{-4}\Big|_{z=e^{j\hat{\omega}}}$$
$$H(e^{j\hat{\omega}}) = (-1+2e^{-j\hat{\omega}2}-4e^{-j\hat{\omega}4})$$



$$H(z) = \left[(1-\sqrt{2}e^{-j\pi/6}z^{-1})(1-\sqrt{2}e^{+j\pi/6}z^{-1})\right]\left[(1+\sqrt{2}e^{-j\pi/6}z^{-1})(1+\sqrt{2}e^{+j\pi/6})\right]$$
$$\left[\left(1-2\sqrt{2}z^{-1}(e^{+j\pi/6}+e^{-j\pi/6})+2z^{-2}\right)\right]\left[\left(1+2\sqrt{2}z^{-1}\left(\cos\left(\tfrac{\pi}{6}\right)\right)+2z^{-2}\right)\right]$$
$$\left(1-\frac{\cancel{2}\sqrt{2}\sqrt{3}}{\cancel{2}}z^{-1}+2z^{-2}\right)\left(1+\frac{\cancel{2}\sqrt{2}\sqrt{3}}{\cancel{2}}z^{-1}+2z^{-2}\right)$$
$$\left(1-\sqrt{2}\sqrt{3}z^{-1}+2z^{-2}\right)\left(1+\sqrt{2}\sqrt{3}z^{-1}+2z^{-2}\right)$$
$$\left[\left(1-\sqrt{2}\sqrt{3}e^{-j\hat{\omega}}+2e^{-2j\hat{\omega}}\right)\left(1+\sqrt{2}\sqrt{3}e^{-j\hat{\omega}}+2e^{-2j\hat{\omega}}\right)\right]$$

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

$$A = \pi r^2$$

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

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

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