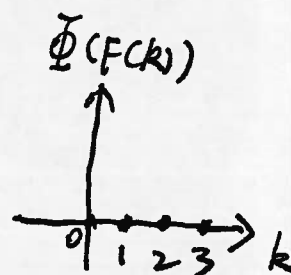
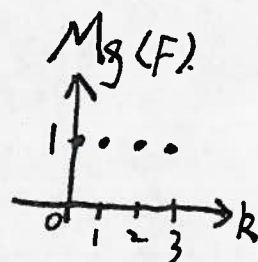
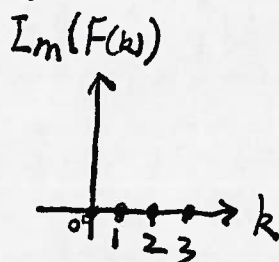
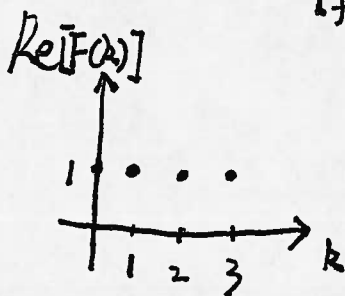


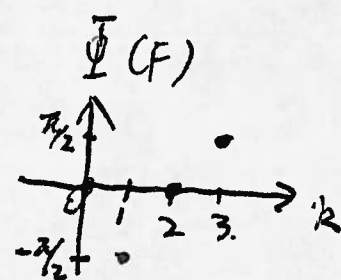
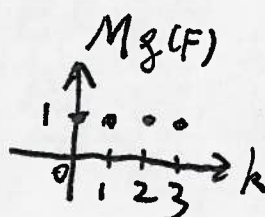
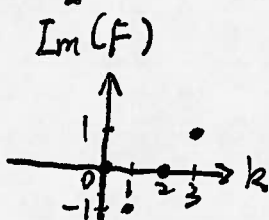
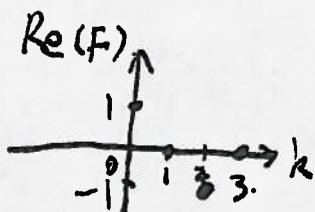
1.)

$$M = \begin{matrix} & k: & 0 & 1 & 2 & 3 \\ n:0 & \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1-i & -1 & i \\ 2 & 1 & -1 & -1 \\ 3 & 1 & i & -1-i \end{bmatrix} \end{matrix}$$

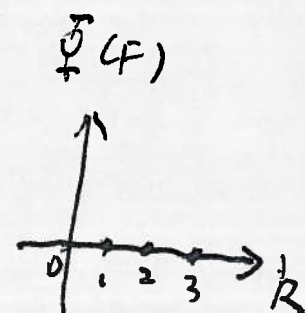
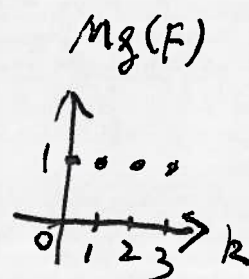
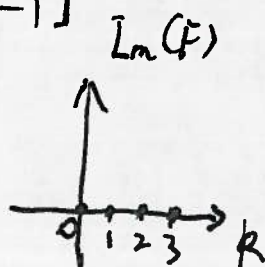
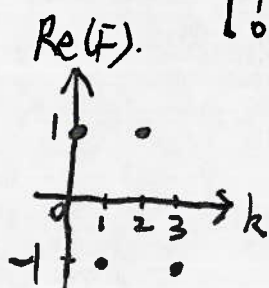
a).  $F = M \cdot \begin{bmatrix} f(0) \\ f(1) \\ f(2) \\ f(3) \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}$



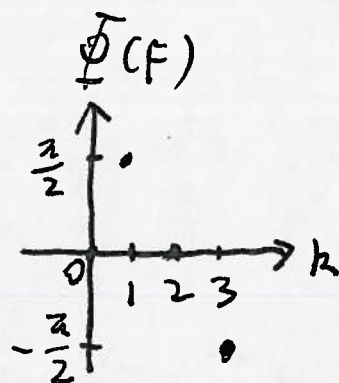
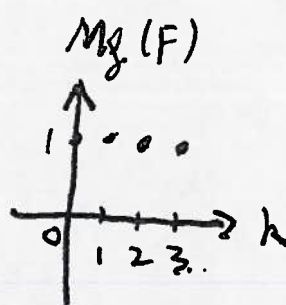
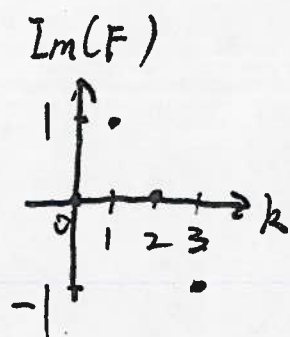
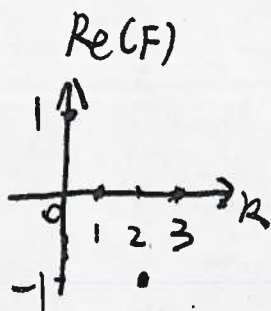
b).  $F = M \cdot \begin{bmatrix} 0 \\ 1 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ -i \\ -1 \\ i \end{bmatrix}$



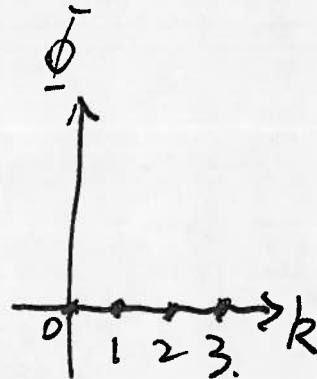
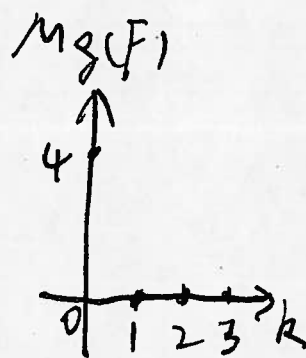
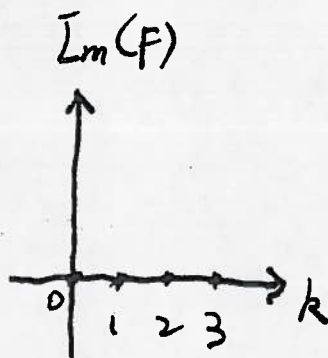
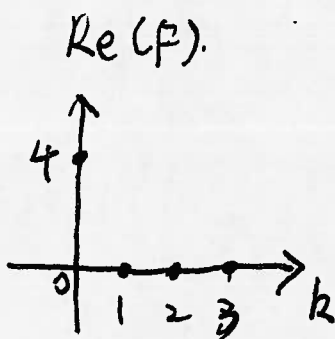
c).  $F = M \cdot \begin{bmatrix} 0 \\ 0 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ -1 \\ 1 \\ -1 \end{bmatrix}$



$$d). F = M \cdot \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ i \\ -1 \\ -i \end{bmatrix}$$

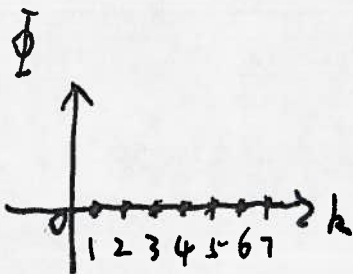
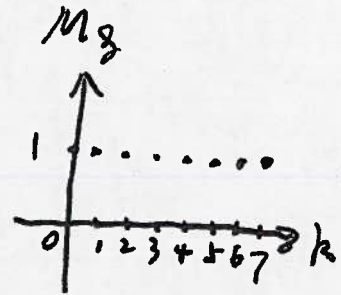
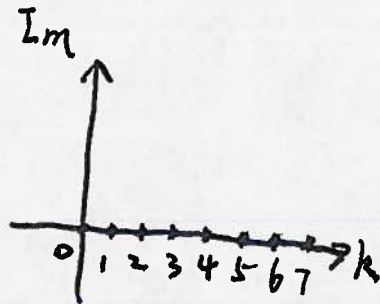
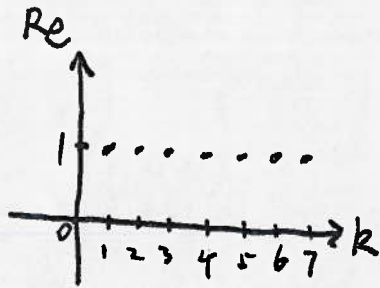


$$e). F = M \cdot \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 4 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

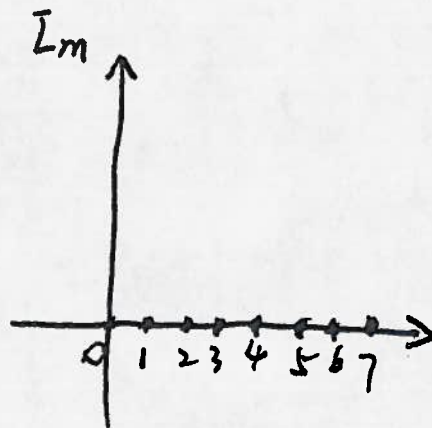
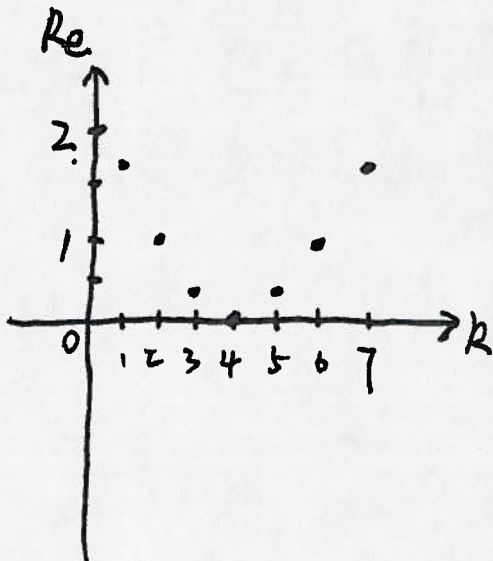


2.)

a)  $F(k) = [1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1]$

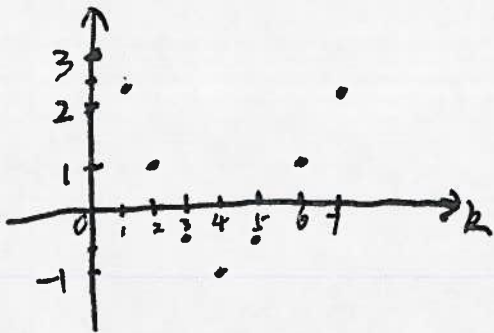


b)  $F(k) = [2 \ 1 + \frac{\sqrt{2}}{2} \ 1 \ 1 - \frac{\sqrt{2}}{2} \ 0 \ 1 - \frac{\sqrt{2}}{2} \ 1 \ 1 + \frac{\sqrt{2}}{2}]$

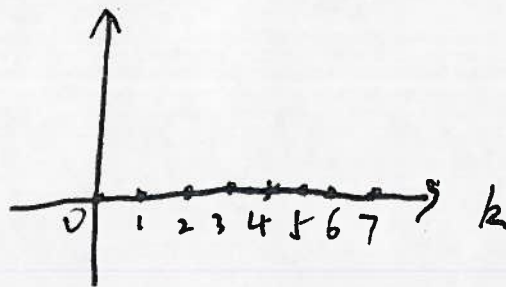


c)  $F = [3 \ 1+\sqrt{2} \ 1 \ 1-\sqrt{2} \ -1 \ 1-\sqrt{2} \ 1 \ 1+\sqrt{2}]$

Re(F)

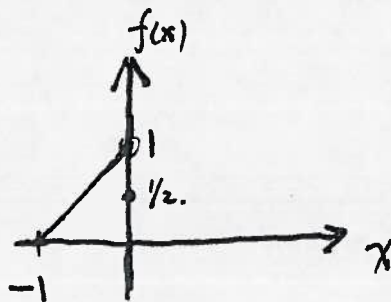


Im(F)

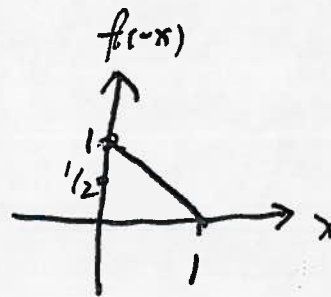


3.)

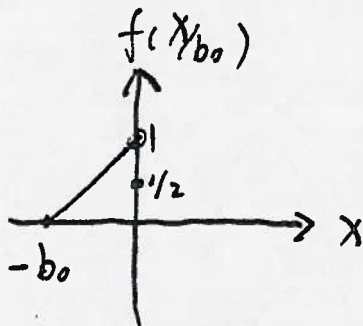
a).



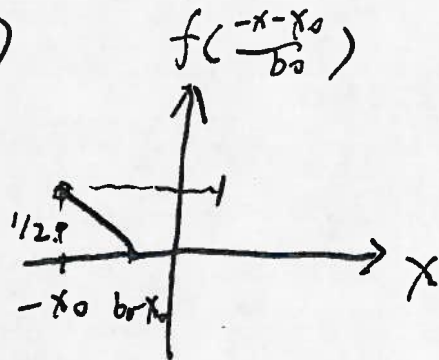
d)



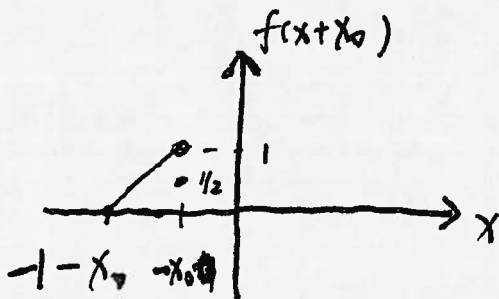
b).



e)

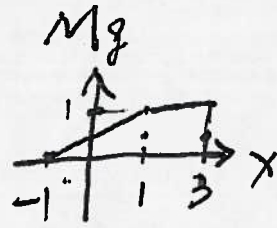
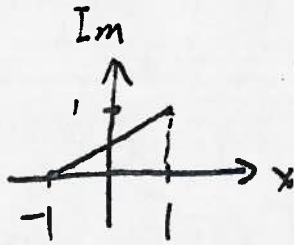
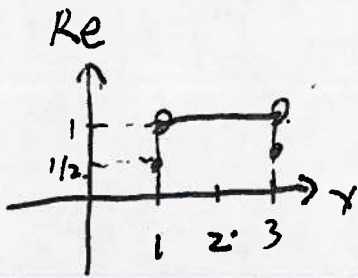


c).

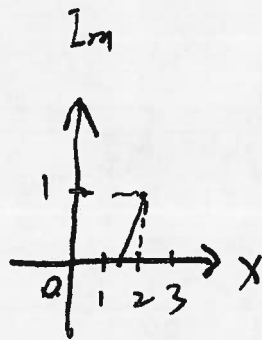
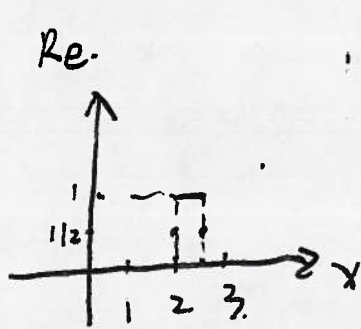


4.

$$f\left(\frac{-x+1}{2}\right):$$

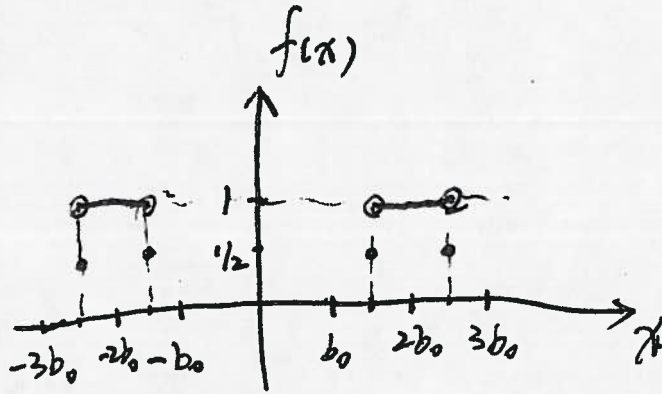


$$f(-2x+4):$$

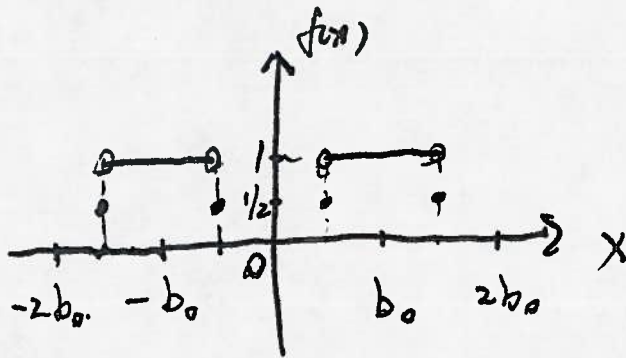


5.

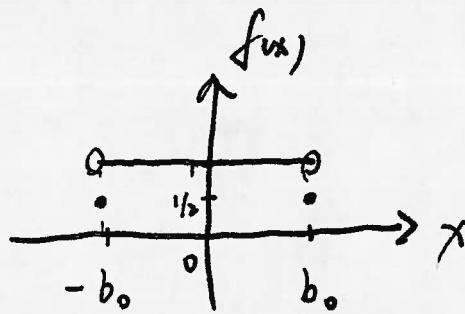
a).



b).

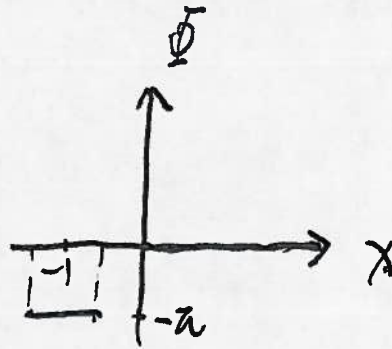
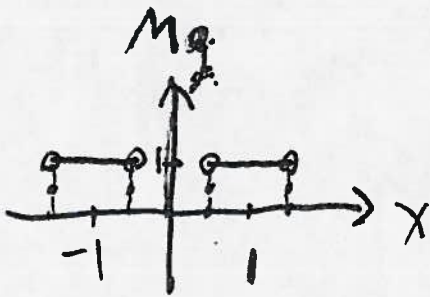
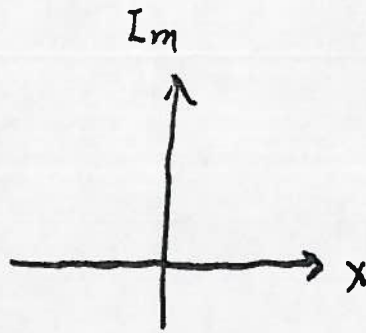
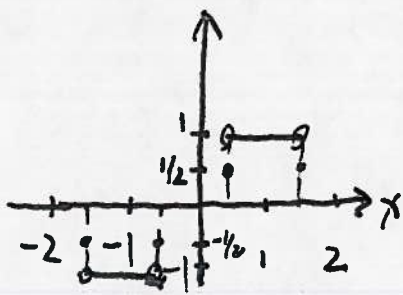


c)

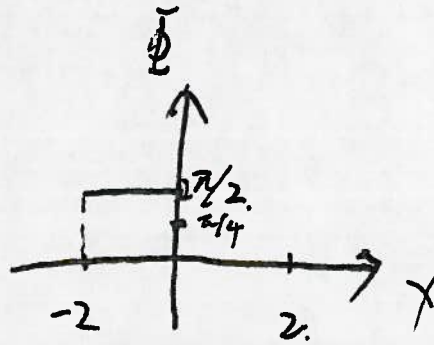
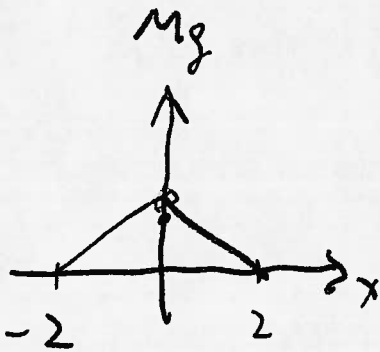
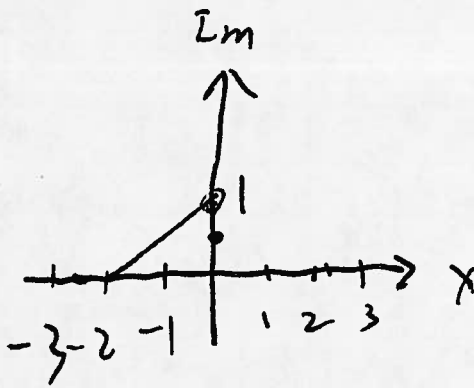
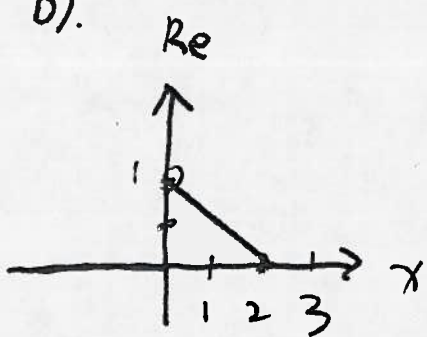


6.

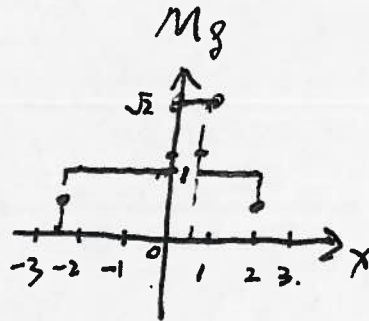
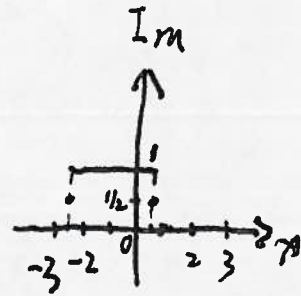
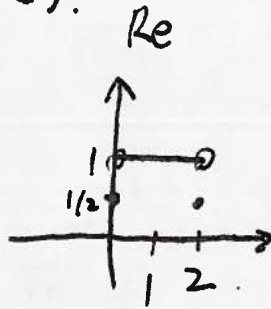
a).



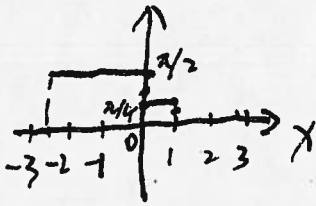
b).



c).



$\Phi$ .



$$\begin{aligned}
 7. & \quad \text{Gauss} \left[ \frac{x+x_0}{b_0} \right] \cdot \text{Gauss} \left[ \frac{x-x_0}{b_0} \right] \\
 & = \exp\left(-\pi(x+x_0)^2/b_0^2\right) \cdot \exp\left(-\pi(x-x_0)^2/b_0^2\right) \\
 & = \exp\left(-2\pi x^2/b_0^2\right) \cdot \exp\left(-\pi x_0^2/b_0^2\right) \\
 & = A_0 \cdot \exp\left(-\pi\left(\frac{x}{b_0}\right)^2\right)
 \end{aligned}$$

$$A_0 = \exp\left(-2\pi x_0^2/b_0^2\right)$$

$$d_0 = \frac{b_0}{\sqrt{2}}$$