

>> ex_3_main

Task 1. we can find by figure that.

$$x(n) = (-0.9)^n u(n).$$

$$\begin{aligned}\therefore \text{DTFT } X(e^{j\omega}) &= \sum_{n=-\infty}^{\infty} (-0.9)^n e^{-j\omega n} u(n) \\ &= \sum_{n=0}^{\infty} (-0.9 e^{-j\omega})^n \\ &= \frac{1}{1 + 0.9 e^{-j\omega}}\end{aligned}$$

Task 2. $N=4$.

$$W_4 \cdot x(n) = \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & -j & -1 & j \\ 1 & -1 & 1 & -1 \\ 1 & j & -1 & -j \end{pmatrix} \begin{pmatrix} 5 \\ 1 \\ -1 \\ 0 \end{pmatrix} = \begin{pmatrix} 5 \\ 6-j \\ 3 \\ 6+j \end{pmatrix}$$

Task 3. we can find $X_0(0)=0$ $X_0(1)=-2$
 $X_1(0)=3$ $X_1(1)=3$.

$$\therefore X(0) = 0 + W_4^0 \cdot 3 = 3$$

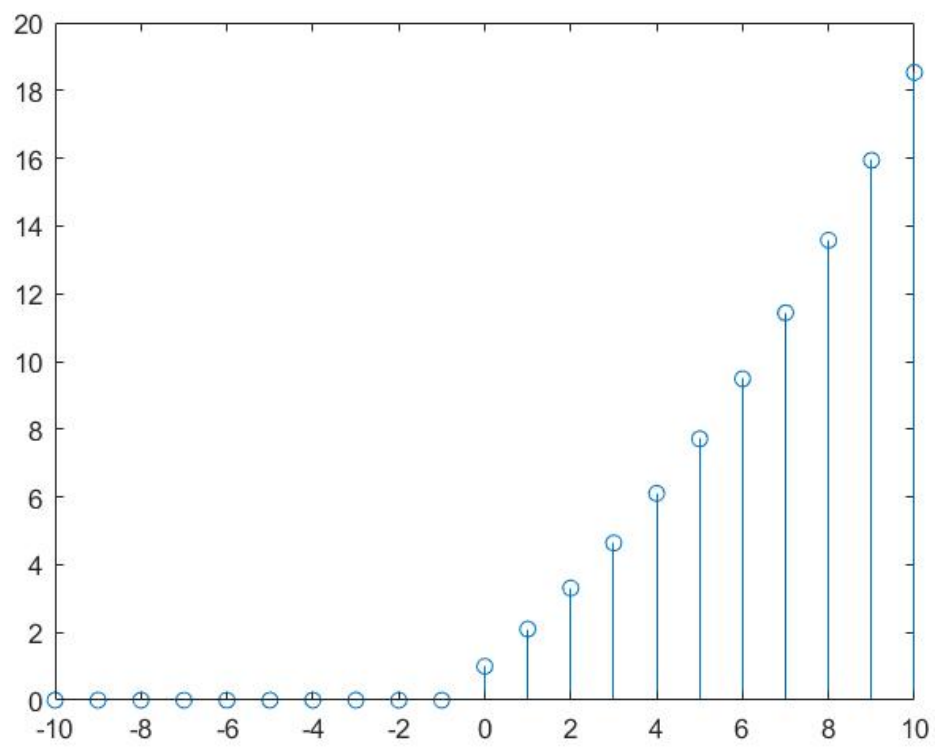
$$X(1) = -2 + -j \cdot 3 = -2 - 3j$$

$$X(2) = 0 - 3 = -3$$

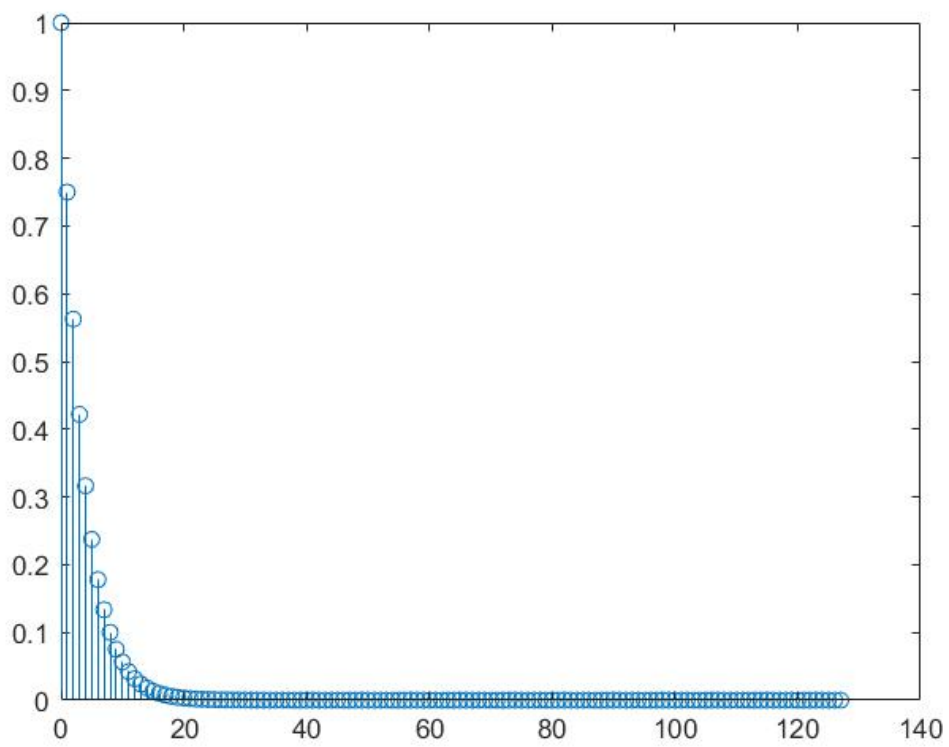
$$X(3) = -2 + j \cdot 3 = -2 + 3j$$

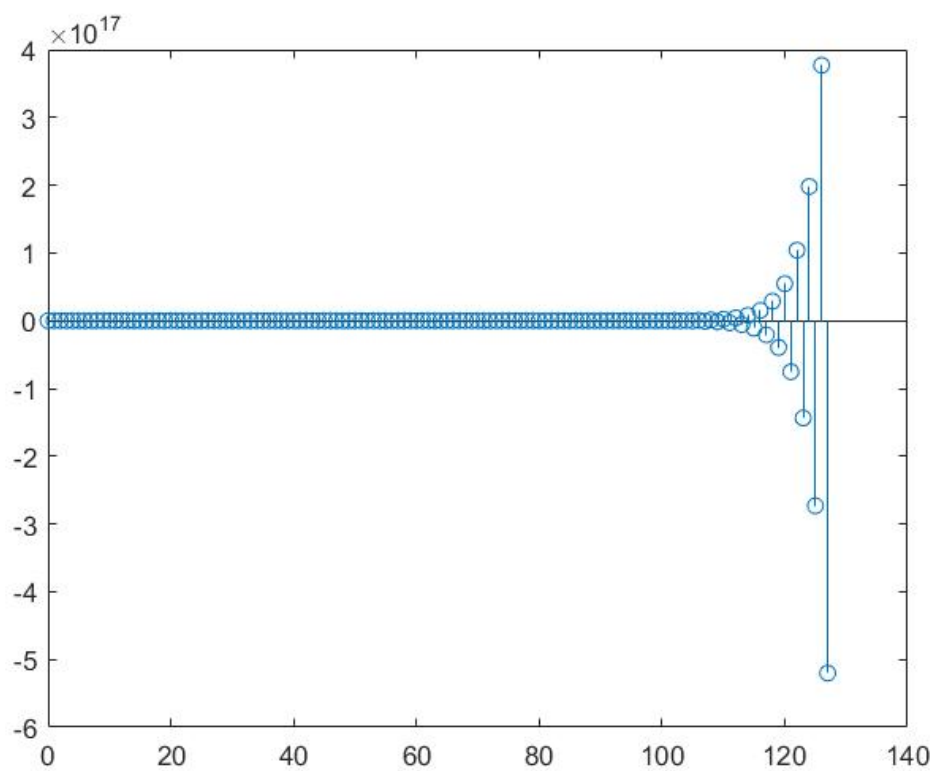
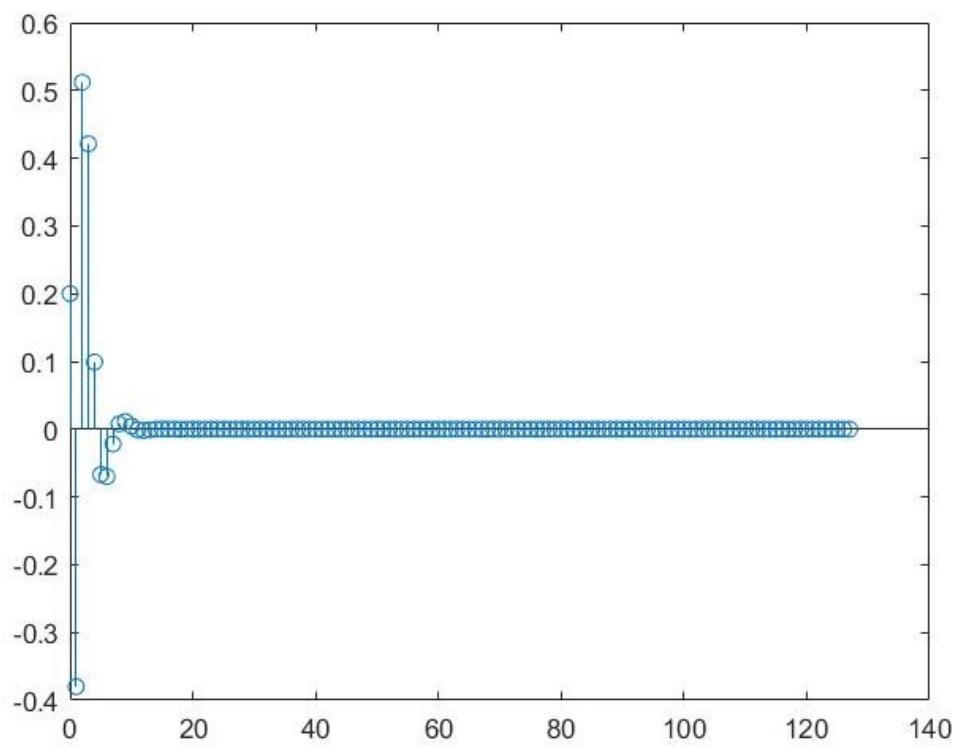
$$\rightarrow \begin{pmatrix} 3 \\ -2-3j \\ -3 \\ -2+3j \end{pmatrix}.$$

task4

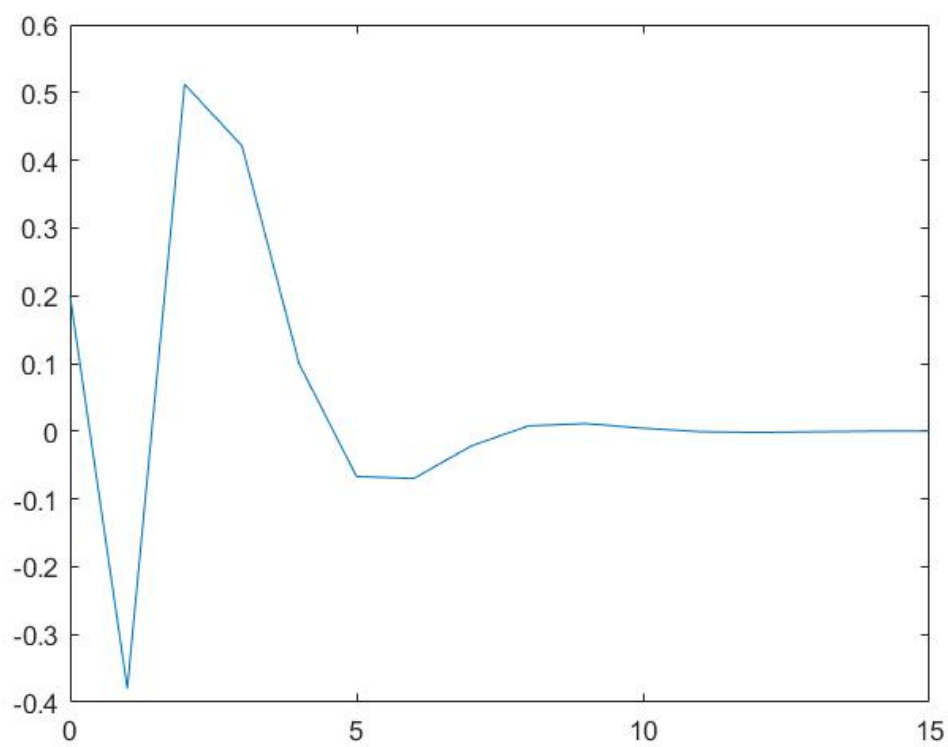
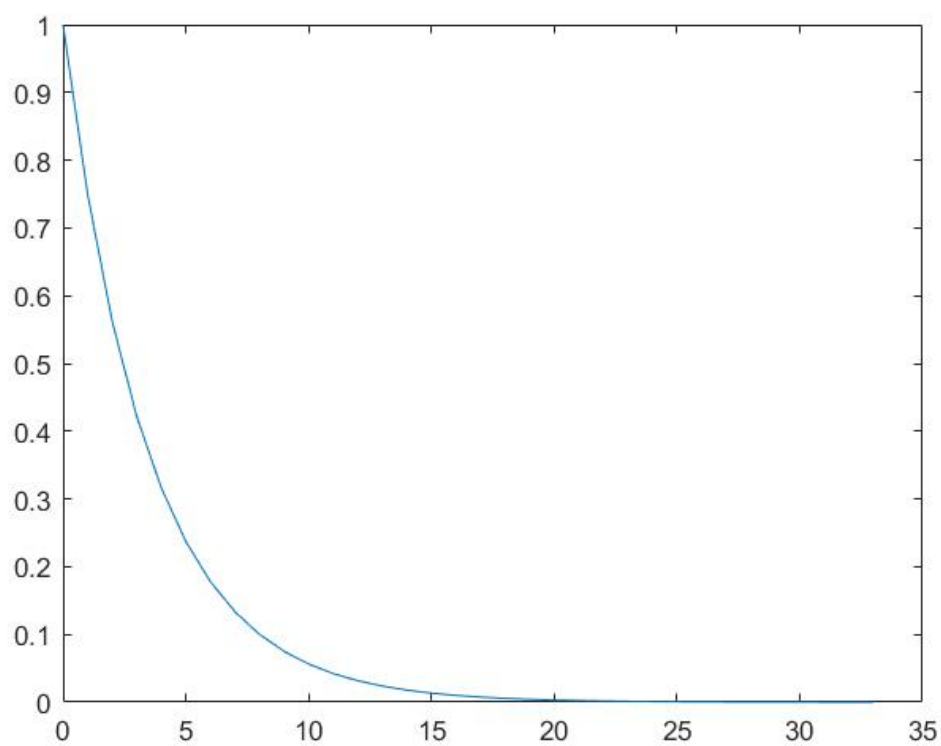


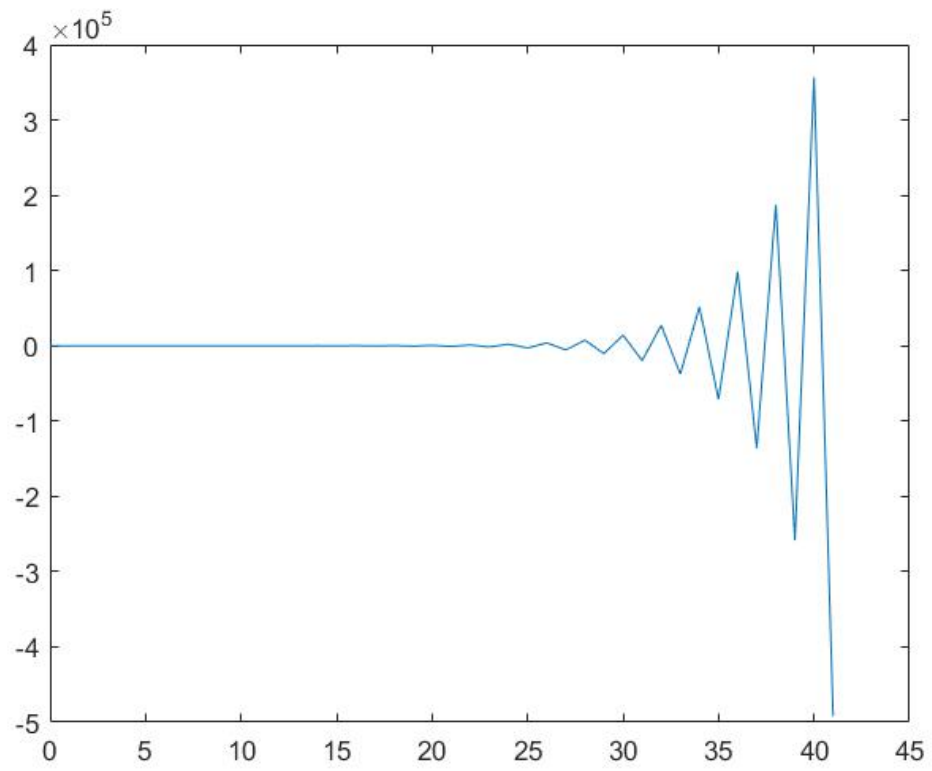
task5



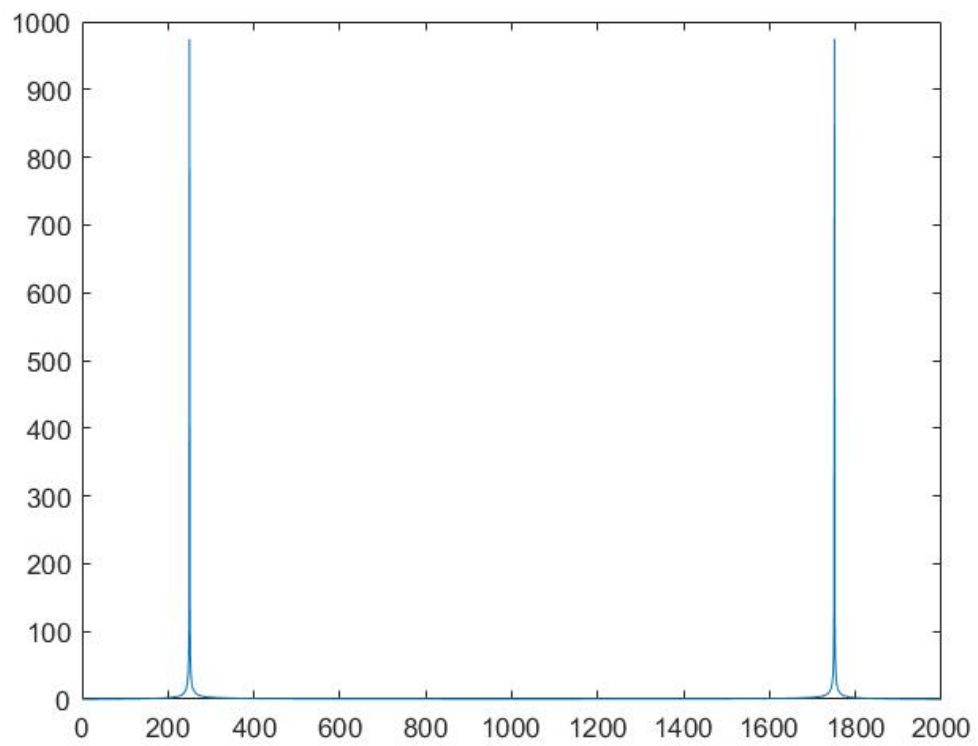


as the stem (c) is not stable
task6





task7



task8

dft =

10.0000 + 0.0000i
-2.0000 + 2.0000i
-2.0000 - 0.0000i
-2.0000 - 2.0000i

task9

elapsed_time =

0.0260

elapsed_time =

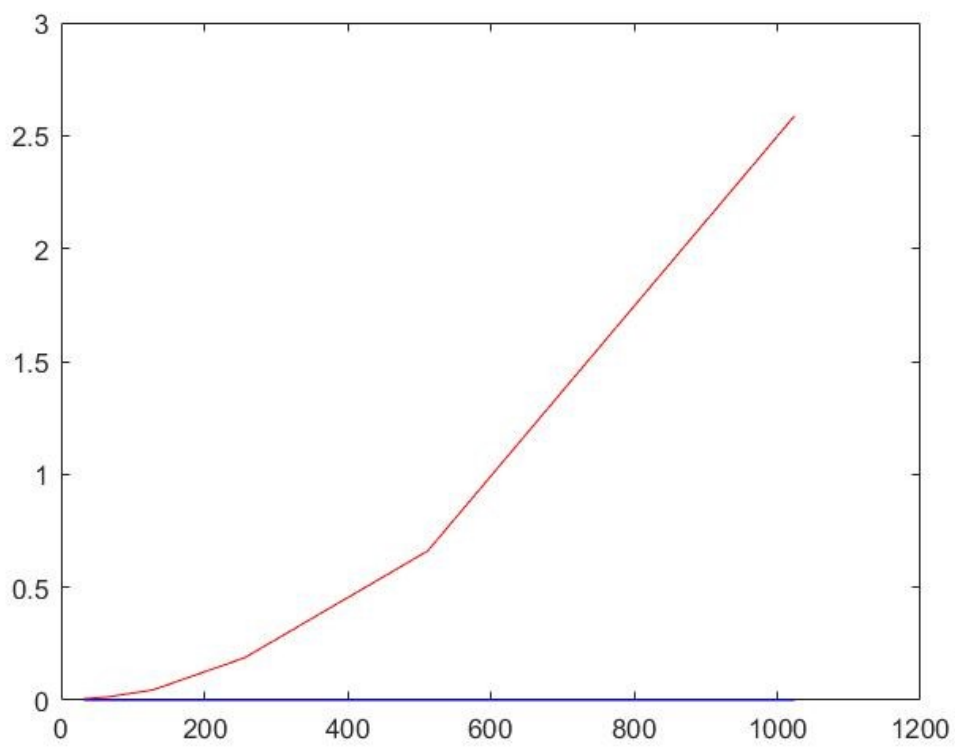
2.4870e-04

elapsed_time =

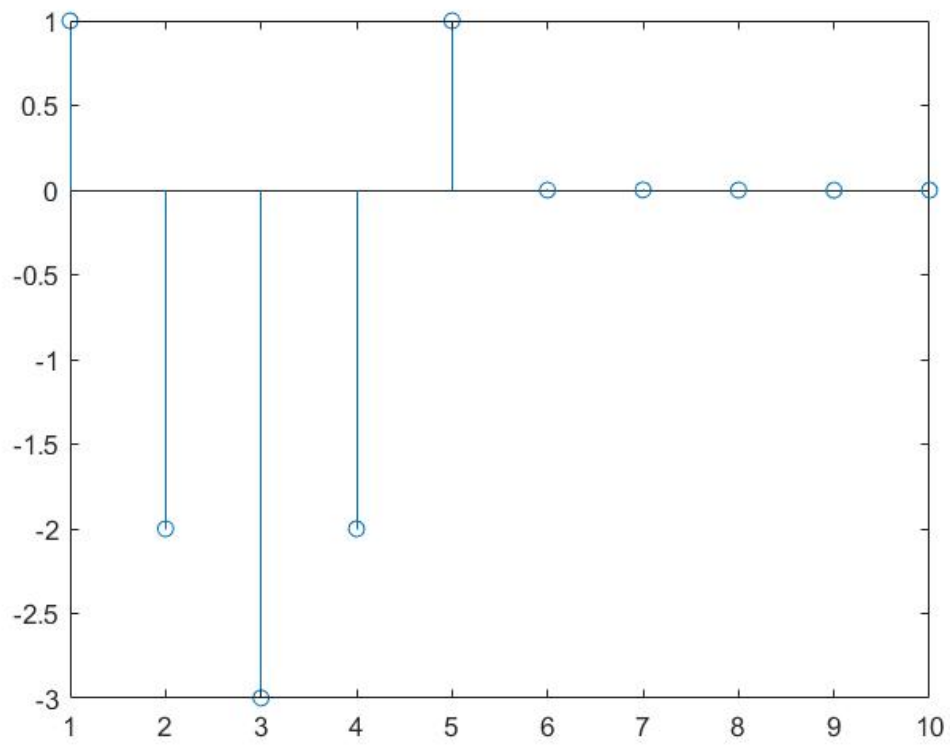
2.4372

elapsed_time =

0.0011



task10



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