

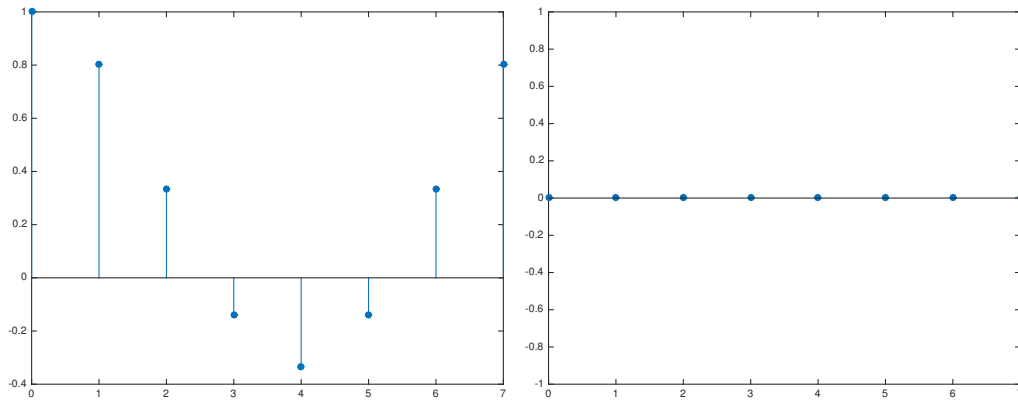
IMGS-261: Linear Mathematics for Imaging

Solution #6

1.

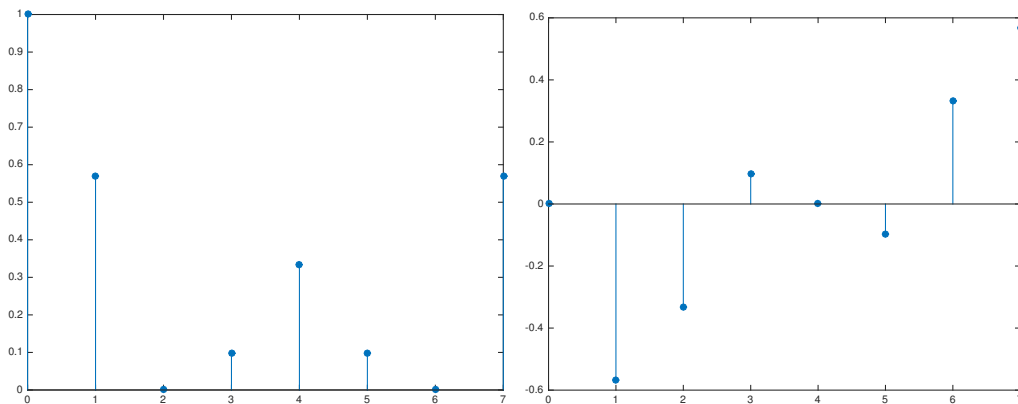
```
function dft = DFT(f)
N=length(f);
n=0:1:N-1;
dft=zeros(1,N);
for k=1:N-1
    dft(k+1)=sum(f.*exp(-1i*2*pi.*n.*k./N));
end
```

2. See figures following



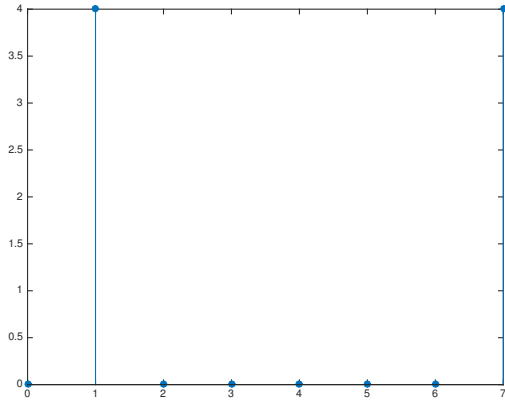
(a) a. Real part of DFT

(b) a. Imaginary part of DFT

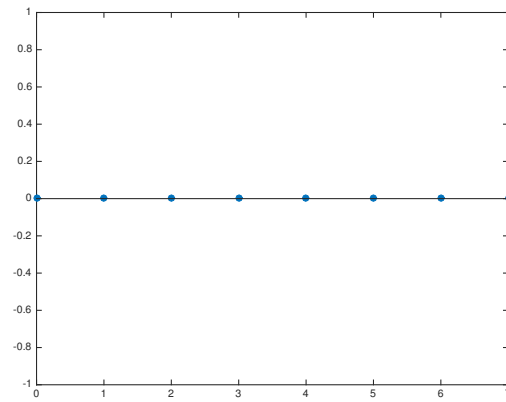


(c) b. Real part of DFT

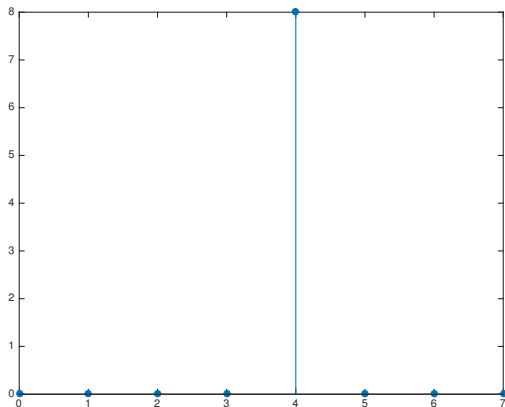
(d) b. Imaginary part of DFT



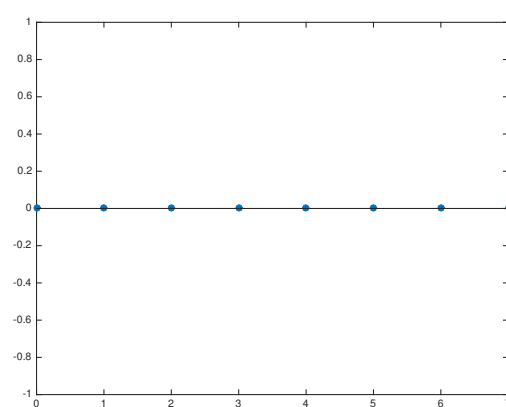
(e) c. Real part of DFT



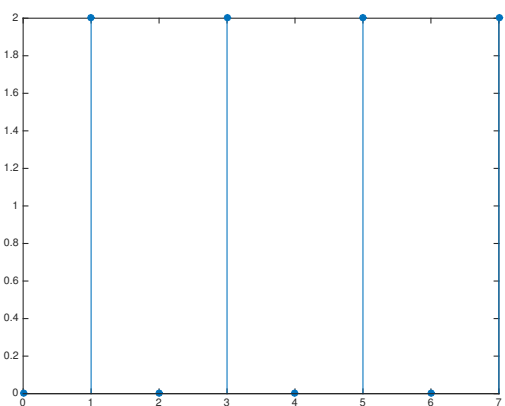
(f) c. Imaginary part of DFT



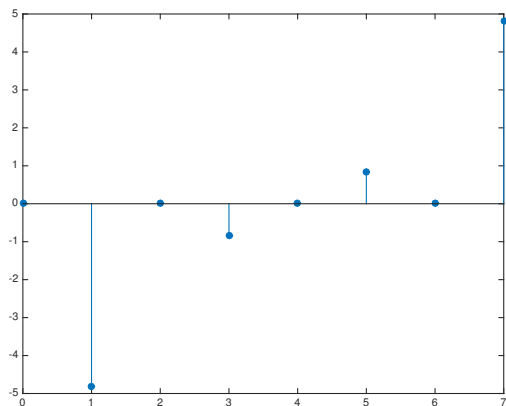
(g) d. Real part of DFT



(h) d. Imaginary part of DFT

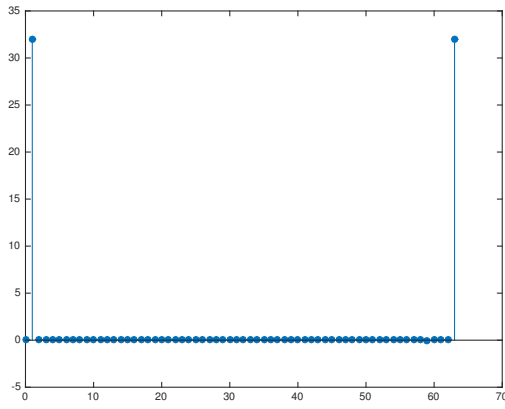


(i) e. Real part of DFT

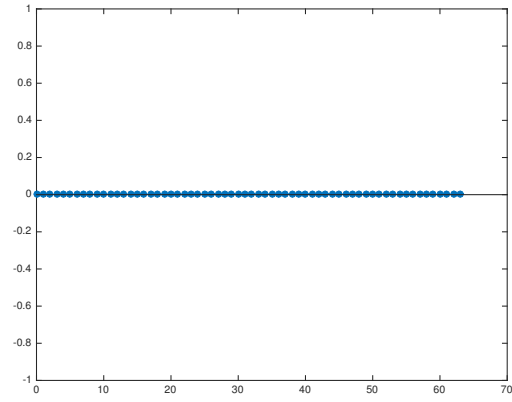


(j) e. Imaginary part of DFT

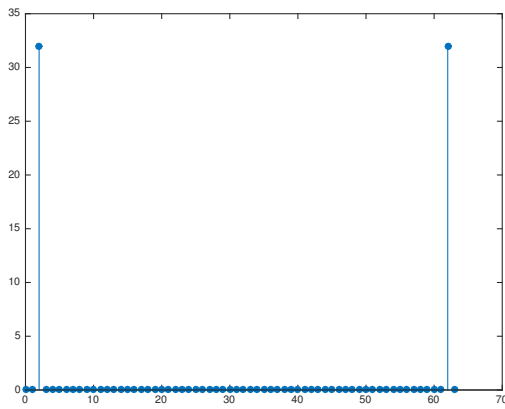
3. See figures following



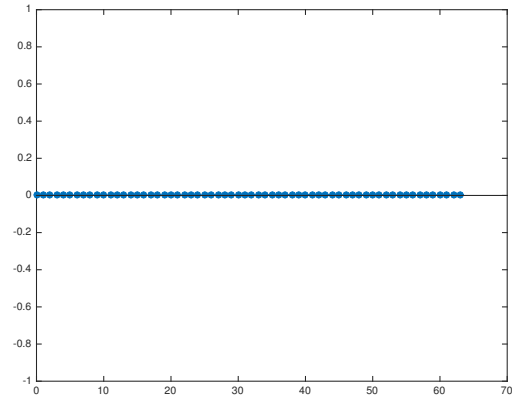
(a) a. Real part of DFT



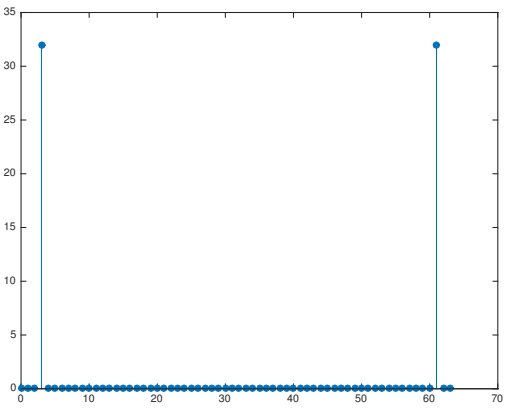
(b) a. Imaginary part of DFT



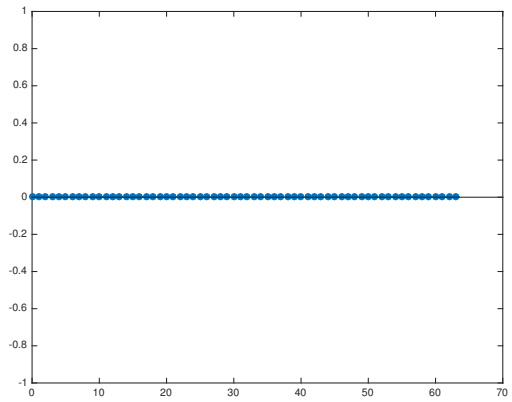
(c) b. Real part of DFT



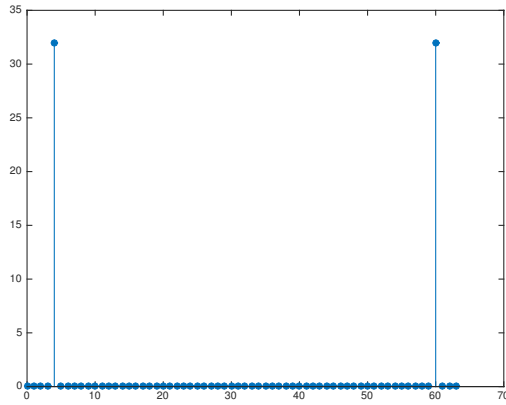
(d) b. Imaginary part of DFT



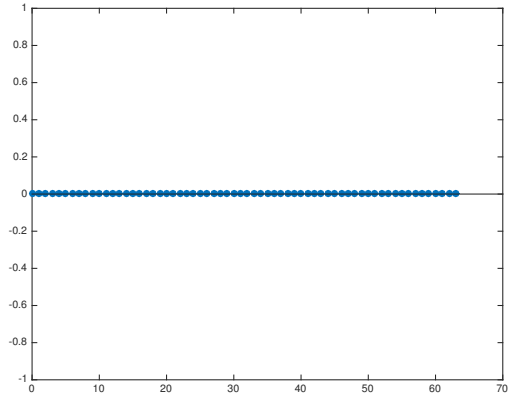
(e) c. Real part of DFT



(f) c. Imaginary part of DFT

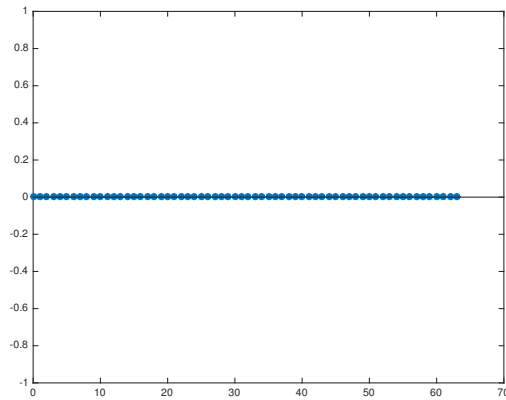


(g) d. Real part of DFT

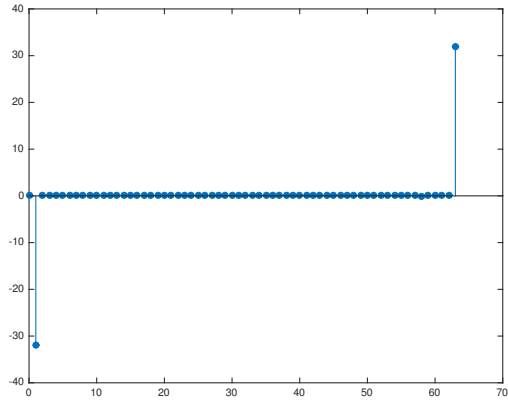


(h) d. Imaginary part of DFT

(e) The values of k where the DFT of the cosine are nonzero are at k equal. If the number of cycles of the cosine in N samples is k ($k = +1, +2, +3$, and $+4$ in these cases), the nonzero values of DFT of the cosine are located at the k th and $N-k$ th ($N-k = 63, 62, 61$, and 60 in these cases) element of DFT.

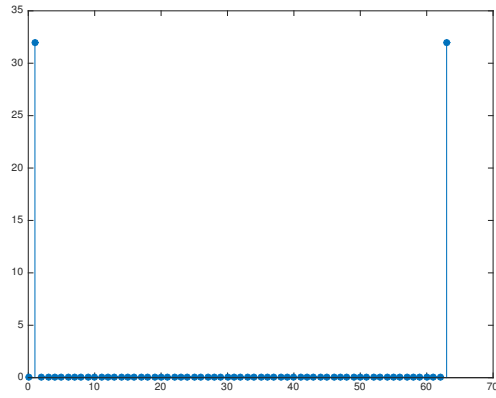


(i) f. Real part of DFT

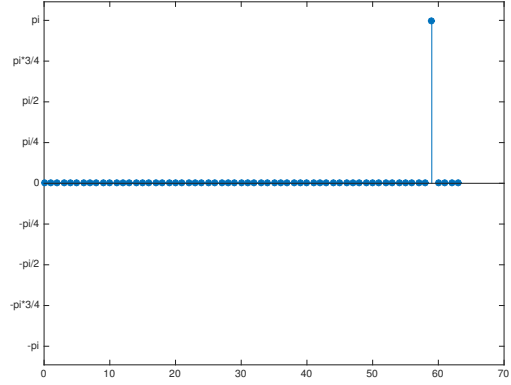


(j) f. Imaginary part of DFT

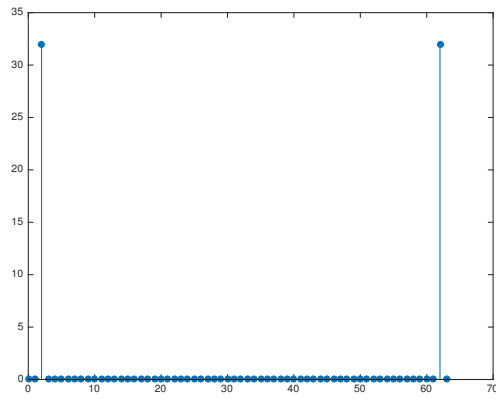
4. See figures following



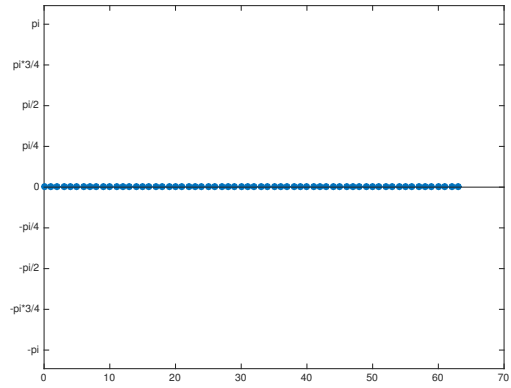
(a) a. Magnitude part of DFT



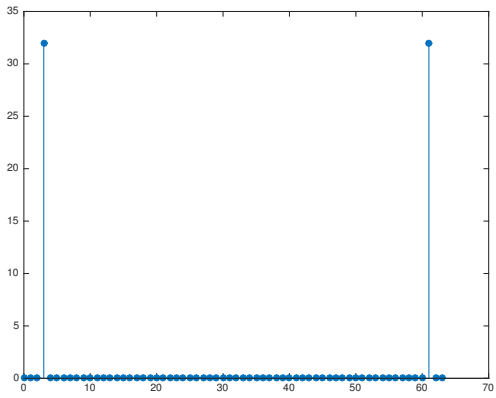
(b) a. Phase part of DFT



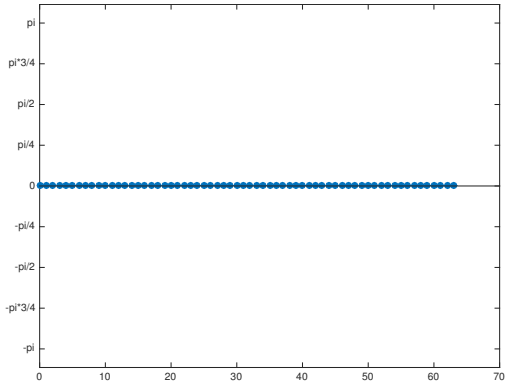
(c) b. Magnitude part of DFT



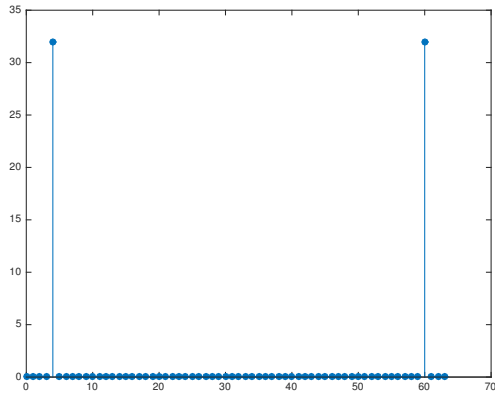
(d) b. Phase part of DFT



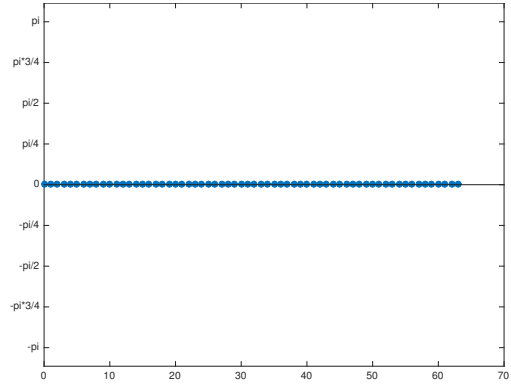
(e) c. Magnitude part of DFT



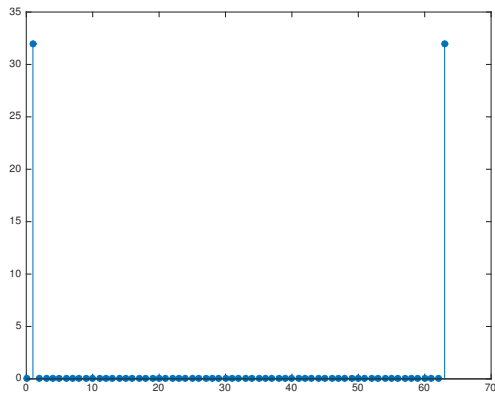
(f) c. Phase part of DFT



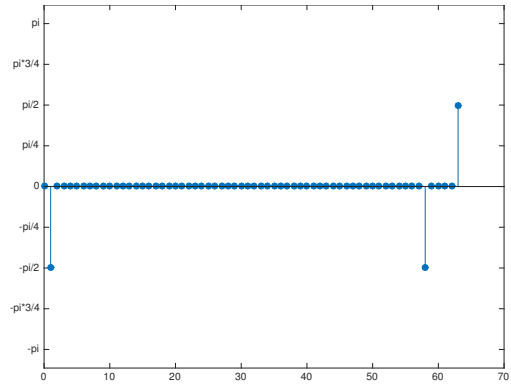
(g) d. Magnitude part of DFT



(h) d. Phase part of DFT



(i) e. Magnitude part of DFT



(j) e. Phase part of DFT