

## 1 Questions

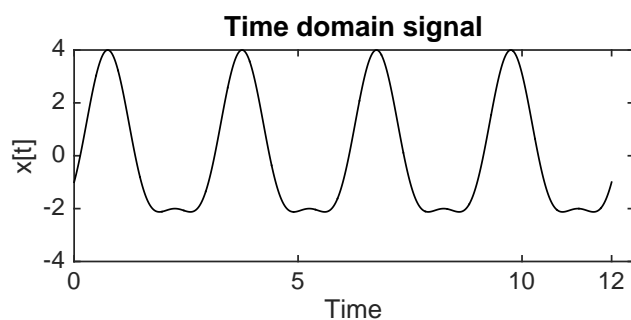
### 1. DFT

- (a) Compute the DFT coefficients of  $x_1[t] = \cos\left(\frac{2\pi}{6}t\right)$  where  $t \in \{0, 1, \dots, 5\}$ .
- (b) Plot the time domain representation and the magnitude and phase for the DFT-basis representation of  $\vec{x}_1$ .
- (c) Compute the DFT coefficients of  $x_2[t] = \cos\left(\frac{4\pi}{6}t\right)$  where  $t \in \{0, 1, \dots, 5\}$ .
- (d) Plot the time-domain representation and the magnitude and phase for the DFT-basis representation of  $\vec{x}_2$ .
- (e) How about the general case,  $x_k[t] = \cos\left(\frac{2\pi}{6}kt\right)$ , where  $t \in \{0, 1, \dots, 5\}$ ?
- (f) Compute the DFT coefficients of  $\vec{s} = [1 \ 0 \ 1 \ 0 \ 1 \ 0]^T$ .
- (g) Compute the DFT coefficients of  $y_1[t] = \cos\left(\frac{2\pi}{6}t - \pi\right)$  where  $t \in \{0, 1, \dots, 5\}$ .

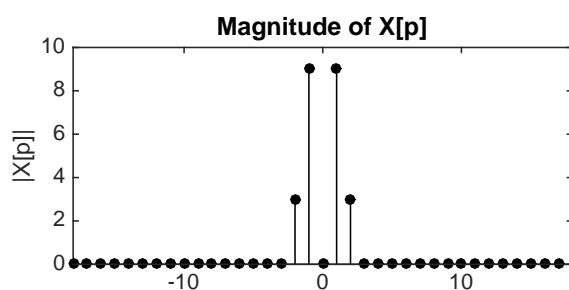
## 2. DFT Sampling Matching

Circle your answer. There is no need to give any justification.

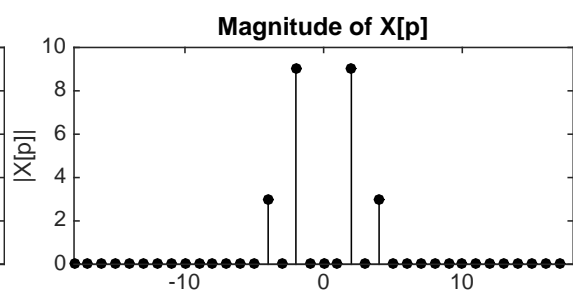
(a) Given the time domain signal below,



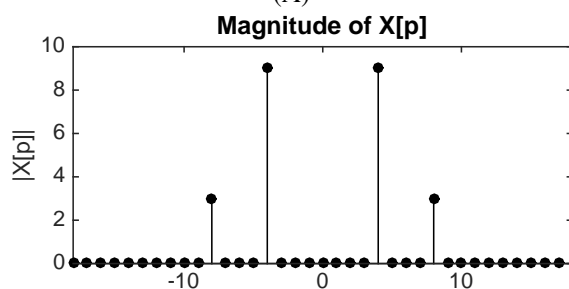
If we sample the signal with frequency 3Hz, which one is the DFT coefficients of the corresponding sampled signal?



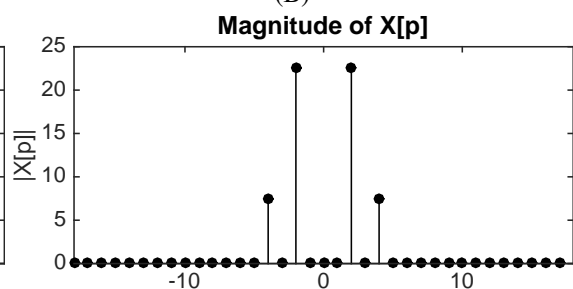
(A)



(B)

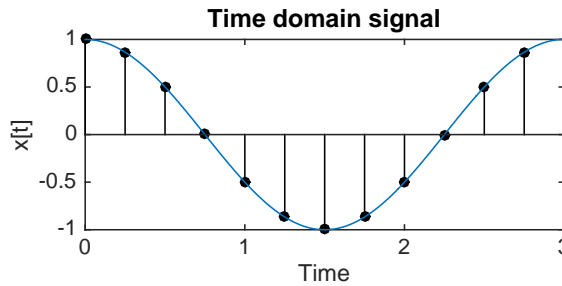


(C)

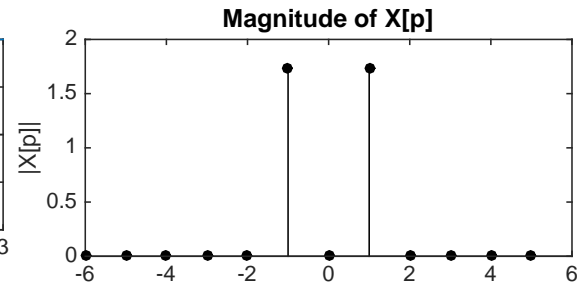


(D)

(b) Given the time domain signal below,

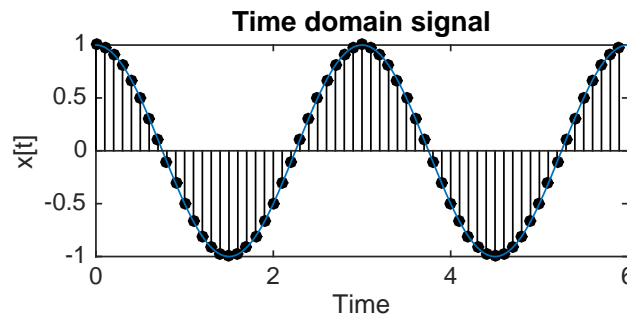


(A) Time domain signal.

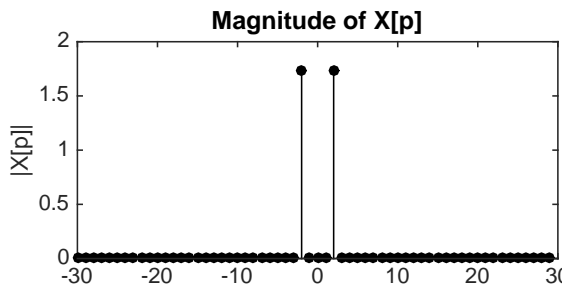


(B) DFT magnitudes.

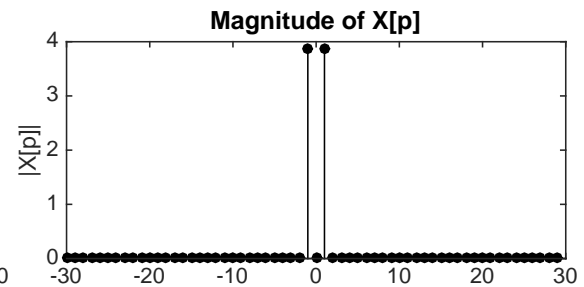
Now, we have sampled the signal with a different frequency (note also that we have a new signal with 2 periods):



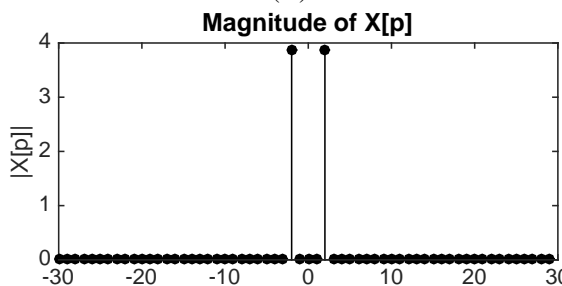
which one is the corresponding DFT coefficients?



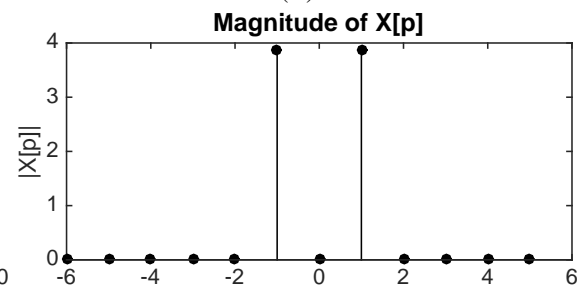
(A)



(B)



(C)



(D)

### Contributors:

- Yen-Sheng Ho.

- Harrison Wang.