ENGR 4333/5333: Digital Signal Processing

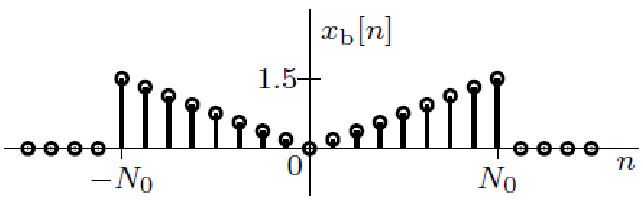
HW 7: Ch6

1) For the following signals, assume $|\gamma| < 1$ and find the DTFT directly using the definition (DTFT equation). For each case, plot the signal and its magnitude and phase spectra (when needed, use $\gamma = 0.8$).

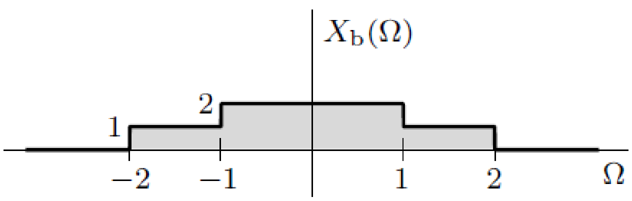
(a) $x_a[n] = \delta[n]$ **(b)** $x_b[n] = \delta[n - k]$ **(c)** $x_c[n] = \gamma^n u[n - 1]$

(d) $x_d[n] = \gamma^n u[n + 1]$ **(e)** $x_e[n] = (-\gamma)^n u[n]$ **(f)** $x_f[n] = \gamma^{|n|}$

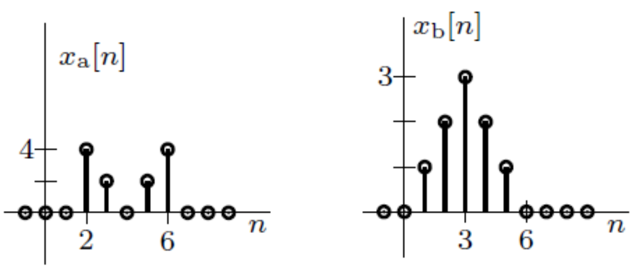
2) Using the definition (the DTFT equation), determine the DTFTs of the signals shown below.



3) Using the definition (the IDTFT equation), determine the IDTFTs of the (real) spectra shown below.



4) Determine the DTFTs of the signals shown below.



5) Using the DTFT properties and the Table find the DTFTs of the following signals, assuming that m and k are integers and $|\gamma| < 1$:

(a) $x_a[n] = u[n] - u[n - 9]$ **(b)** $x_b[n] = \gamma^{n-m} u[n - m]$ **(c)** $x_c[n] = a\gamma^{n-3} (u[n] - u[n - 10])$

(d) $x_d[n] = \gamma^{n-m} u[n]$ **(e)** $x_e[n] = \gamma^n u[n - m]$ **(f)** $x_f[n] = (n - m)\gamma^{n-m} u[n - m]$

6) For the signal $x[n] = 0.5 \text{ sinc}^2(n/4)$, find and sketch its DTFT. This signal modulates a carrier $\cos(\Omega_c n)$. Find and sketch the DTFT of the modulated signal $x[n] \cos(\Omega_c n)$ if Ω_c is **(a)** $\pi/2$, **(b)** $3\pi/4$, and **(c)** π.