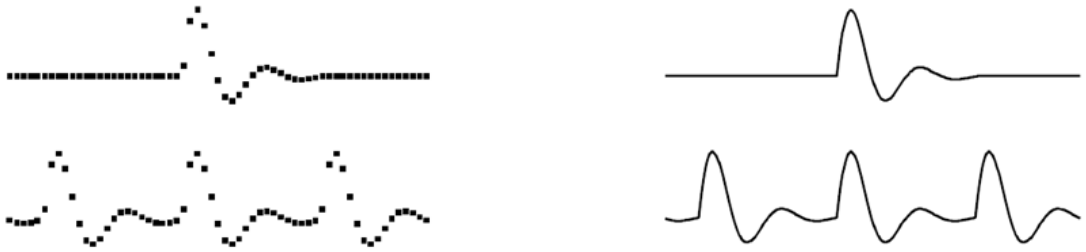
DFT

1. Which type of Fourier transforms is adequate to transform the following signals to the frequency domain:



2. Find the DFT of the following signals:
   a. $x[n]=\delta[n]$
   b. $x[n]=\delta[n-n_0]$ $\quad 0\le n_0\le N\text{-}1$
   c. $x[n]=\begin{cases}1 & n\ even,\quad 0\le n\le N-1\\ 0 & n\ odd,\quad 0\le n\le N-1\end{cases}$
   d. $x[n]=\begin{cases}1 & 0\le n\le N/2-1\\ 0 & N/1\le n\le N-1\end{cases}$
   e. $x[n]=\begin{cases}a^n & 0\le n\le N-1\\ 0 & otherwise\end{cases}$
3. Find the time domain signal corresponding to the following Frequency domain signal:
   $\mathrm{Im}\,X[k]=\sin 2\pi k/N \quad ,0\le k\le N/2-1$
   $\mathrm{Re}\,X[k]=\cos 2\pi k/N \quad ,0\le k\le N/2-1$
4. This problem walks you through all the steps required to calculate the DFT of a continuous signal. The input signal to an ADC is given by:
   $x(t)=\sin(2000\pi t)+0.5\sin(4000\pi t+3\pi/4)$
   a. Find the sampling frequency required to get 8 samples per cycle of $x(t)$
   b. Find the eight samples constituting $x[n]$
   c. Find the frequency spectrum *ReX* and *ImX*
   d. Use IDFT to re-calculate the time domain version of *X[f]*.
5. Find the N points DFT of the following signal:
   $x[n]=\begin{cases}A & 0\le n\le N/2\\ 0 & otherwise\end{cases}$
6. Draw the DFT of the following signal after it is sampled with a sampling frequency of 8K:
   $x(t)=\sin(2000\pi t)+0.25\sin(4000\pi t)$