Quiz #3
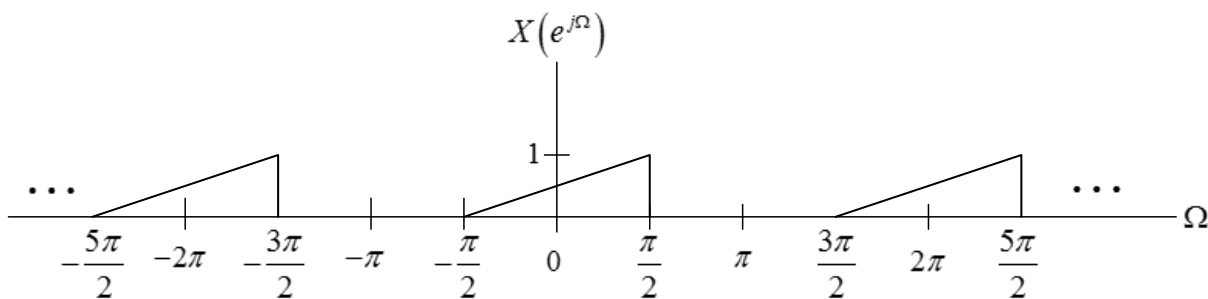
Dec. 4, 2014

Student ID:_____   Name:_____   Department:_____

1. Consider a discrete-time signal $x[n]$ with Fourier transform $X(e^{j\Omega})$ shown below. Sketch the discrete-time Fourier transform of each of the following signals:

   (a) $y_1[n] = \begin{cases} x[n/3] & \text{, if } n \text{ is a multiple of 3} \\ 0 & \text{, if } n \text{ is not a multiple of 3} \end{cases}$.
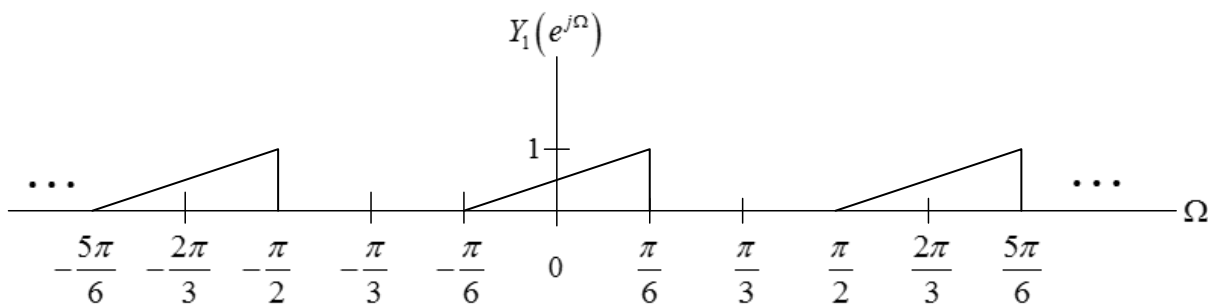
   (b) $y_2[n] = (x[n] + (-1)^n \cdot x[n])/2$.

Answer:

(a)

$$Y_1(e^{j\Omega}) = X(e^{j3\Omega})$$

(b)

$$y_2[n] = \left(x[n] + (-1)^n \cdot x[n]\right)/2$$

$$= \left(x[n] + e^{-j\pi n} \cdot x[n]\right)/2$$

$$Y_2\left(e^{j\Omega}\right) = \left[X\left(e^{j\Omega}\right) + X\left(e^{j(\Omega+\pi)}\right)\right] \cdot \frac{1}{2}$$