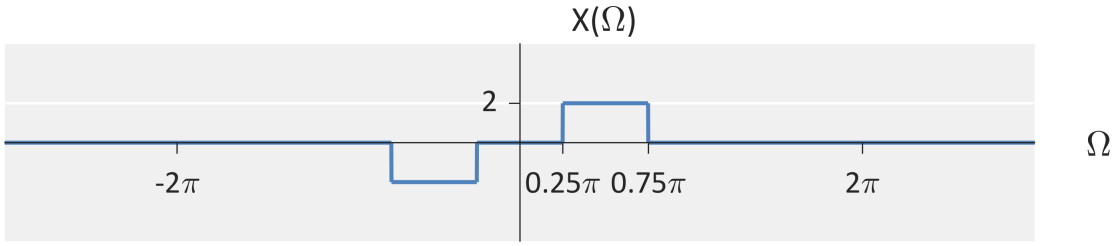
Full Name: _____

EEE 5502 (Fall 2022) – Practice **Sampling, 2022**

Question #1: Consider the Fourier transform of $x(t)$, shown below.



(a) Determine the Nyquist sampling rate for $x(t)$ (in angular frequency).

(b) Sketch the Fourier transform $X_s(\Omega)$ of the sampled $X(\Omega)$ with a sampling rate of $\Omega_s = 4\pi$. Do we experience aliasing?

(c) Sketch the Fourier transform $X_s(\Omega)$ of the sampled $X(\Omega)$ with a sampling rate of $\Omega_s = 2\pi$. Do we experience aliasing?

(d) Sketch the Fourier transform $X_s(\Omega)$ of the sampled $X(\Omega)$ with a sampling rate of $\Omega_s = 3\pi/2$. Do we experience aliasing?

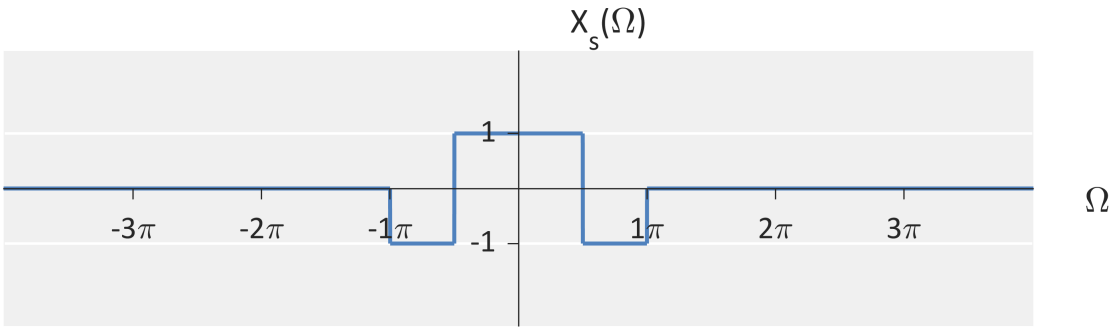
(e) Sketch the Fourier transform $X_s(\Omega)$ of the sampled $X(\Omega)$ with a sampling rate of $\Omega_s = 5\pi/4$. Do we experience aliasing?

(f) Sketch the Fourier transform $X_s(\Omega)$ of the sampled $X(\Omega)$ with a sampling rate of $\Omega_s = \pi$. Do we experience aliasing?

(g) Sketch the Fourier transform $X_s(\Omega)$ of the sampled $X(\Omega)$ with a sampling rate of $\Omega_s = 5\pi/4$ after applying an anti-aliasing filter with cut-off $\Omega_s/2$.

(h) Sketch the Fourier transform $X_s(\Omega)$ of the sampled $X(\Omega)$ with a sampling rate of $\Omega_s = \pi$ after applying an anti-aliasing filter with cut-off $\Omega_s/2$.

Question #2: Consider the Fourier transform of $x(t)$, shown below



(a) Determine the Nyquist sampling rate for $x(t)$ (in angular frequency).

(b) Sketch the Fourier Transform (for $\Omega = -4\pi$ to $\Omega = 4\pi$) of the sampled signal with a sampling rate $\Omega_s = 3\pi$.

(c) Sketch the Fourier Transform (from $\Omega = -4\pi$ to $\Omega = 4\pi$) of the sampled signal with a sampling rate $\Omega_s = \pi$ **after** applying a low-pass anti-aliasing filter with cutoff-off at $\Omega_s/2$.