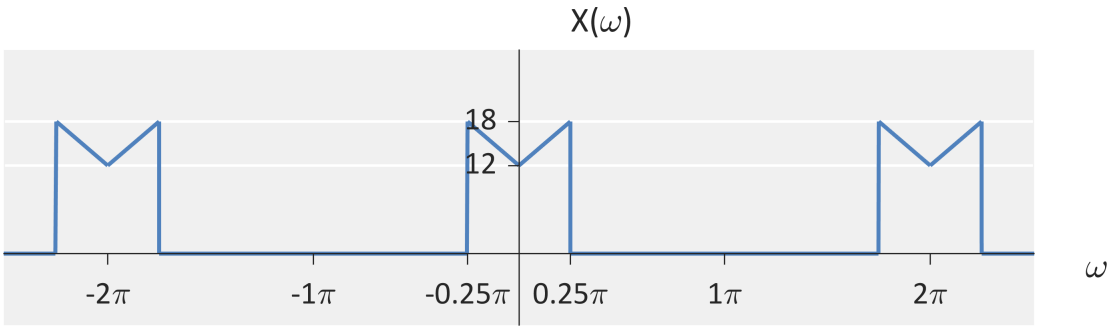
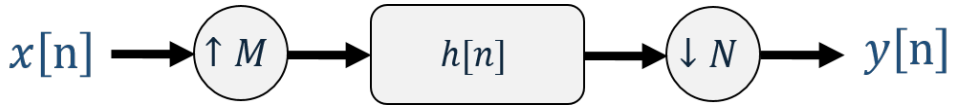
Full Name: _____

EEE 5502 (Fall 2022) – Practice **Sample Rate Conversions, 2022**

Question #1: Consider the discrete-time Fourier transform of $x[n]$ (i.e., $X(\omega)$) and the upsampling/downsampling system below. Assume $h[n]$ is an ideal decimation / interpolation filter for the given M and N.





(a) Sketch DTFT of $y[n]$ (i.e., $Y(\omega)$) for $M = 5$, $N = 3$

(b) Sketch DTFT of $y[n]$ (i.e., $Y(\omega)$) for $M = 2$, $N = 9$

Question #2: One of the useful aspects of Noble properties is that they can help simplify complex expressions with downsampling and upsampling.

(a) Use the Noble properties for upsampling and downsampling to simplify the following block digram. Represent the results as a block diagram. It should only have one downsampling operation, one upsampling operation, and one filter operation.