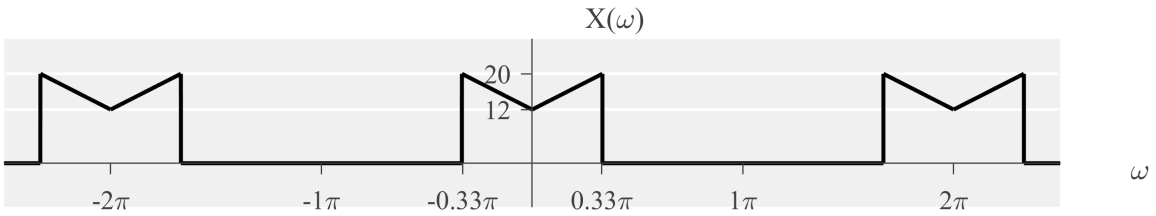
Full Name: _____

EEL 4750 / EEE 5502 (Fall 2018) – HW #09 **Due Date: Oct. 26, 2018**

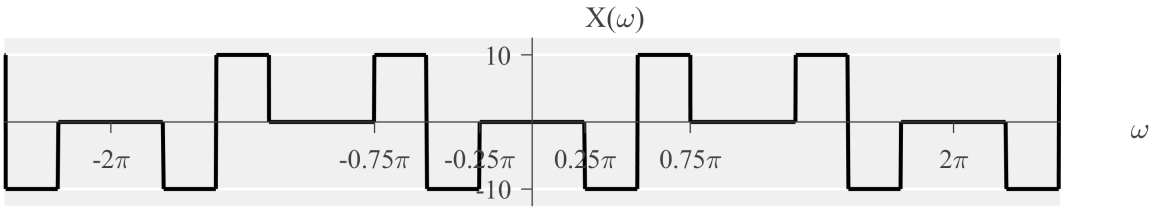
Question #1: *(1 pts)* How many hours did you spend on this homework?

Question #2: *(14 pts)* Consider the DTFT of $x[n]$ (i.e., $X(\omega)$) shown by



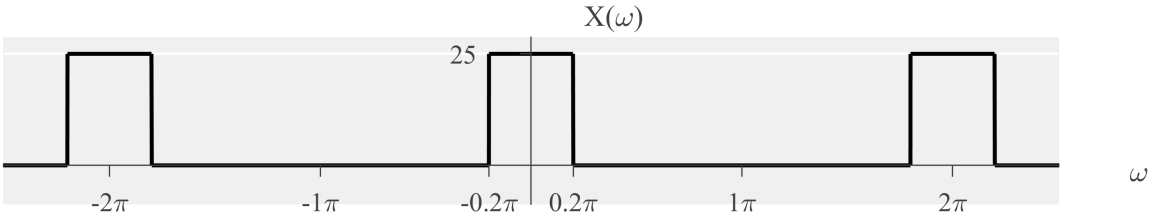
(a) Sketch the DTFT of $x[n]$ after downsampling by 2 (without a low-pass anti-aliasing filter)
(b) Sketch the DTFT of $x[n]$ after downsampling by 2 (with a low-pass anti-aliasing filter)
(c) Sketch the DTFT of $x[n]$ after downsampling by 6 (without a low-pass anti-aliasing filter)
(d) Sketch the DTFT of $x[n]$ after downsampling by 6 (with a low-pass anti-aliasing filter)
(e) Sketch the DTFT of $x[n]$ after upsampling by 2 (without a low-pass interpolating filter)
(f) Sketch the DTFT of $x[n]$ after upsampling by 2 (without a low-pass interpolating filter)
(g) Sketch the DTFT of $x[n]$ after upsampling by 2 (with a low-pass interpolating filter)

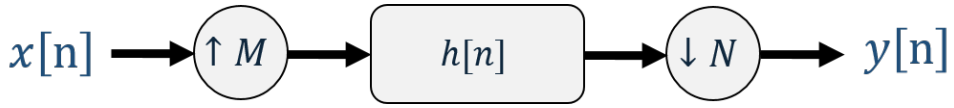
Question #3: *(16 pts)* Consider the discrete-time Fourier transform of $x[n]$ (i.e., $X(\omega)$).



(a) Sketch the DTFT of $x[n]$ after downsampling by 2 (without a low-pass anti-aliasing filter)
(b) Sketch the DTFT of $x[n]$ after downsampling by 2 (with a low-pass anti-aliasing filter)
(c) Sketch the DTFT of $x[n]$ after downsampling by 3 (without a low-pass anti-aliasing filter)
(d) Sketch the DTFT of $x[n]$ after downsampling by 3 (with a low-pass anti-aliasing filter)
(e) Sketch the DTFT of $x[n]$ after upsampling by 2 (without a low-pass interpolating filter)
(f) Sketch the DTFT of $x[n]$ after upsampling by 2 (with a low-pass interpolating filter)
(g) Sketch the DTFT of $x[n]$ after upsampling by 4 (without a low-pass interpolating filter)
(h) Sketch the DTFT of $x[n]$ after upsampling by 4 (with a low-pass interpolating filter)

Question #4: *(6 pts)* 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 the DTFT of $y[n]$ (i.e., $Y(\omega)$) for $M = 3$, $N = 2$

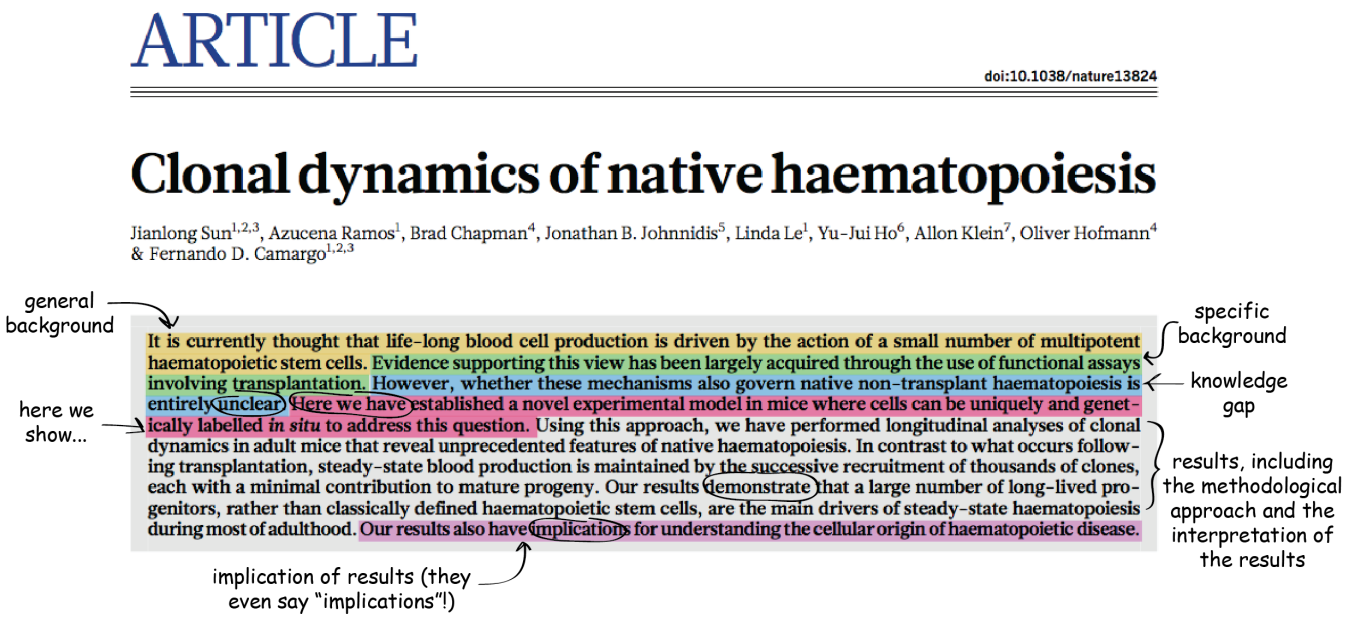
(b) Sketch the DTFT of $y[n]$ (i.e., $Y(\omega)$) for $M = 2$, $N = 5$

(c) Sketch the DTFT of $y[n]$ (i.e., $Y(\omega)$) for $M = 120$, $N = 234$

Question #5: *(3 pts) Project (EEE 5502 only)* Find two more academic papers that go into more depth about your the topic you chose in HW #7. Use resources such as Google Scholar to find these papers. You may need to use the library's off-campus collections access (http://cms.uflib.ufl.edu/offcampus) to download these papers. Try to get one paper the focuses on theory and one paper that focuses on application of your topic. Provide reference for these two paper as part of your homework.

Question #6: *(3 pts) Project (EEE 5502 only)* Write a 400 words or less abstract on a review of the topic you have chosen (using your three as the foundation for the review).

An abstract is the complete summary of paper. Below shows the basic anatomy of an abstract.



Abstracts typically have the following 6 parts:

- **Big-picture motivation:** Start with a broad background or motivation that describes why the reader should care about the complete paper (e.g., curing cancer.)
- **Small-picture motivation:** Describe a specific challenge / motivation / question / problem that is discussed in your review paper that is related to the larger motivation (e.g., isolating a particular protein with links to cancer).
- **The Knowledge Gap:** Describe what needs to studied / accomplished to better understand / overcome the previous question / challenge.
- **The Thesis Statement:** Discuss how the paper (or in this case, the papers you are review) overcomes this specific challenge or what it uncovers in its study.
- **Methods / Results:** Detail of the methodology and (ideally quantitative) results that come from that approach.
- **Conclusions:** Finally, the abstract provides from big-picture connections with the results.