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# 2014 Fall - Introduction to Communication Systems

## Homework 3

### Matlab Exercises

Do 2 of the 3 exercises of choice in the set 4. $j$  for  $j \in \{1 \dots 3\}$ .

In your report include also the code you wrote. Please comment the code sufficiently for us to understand it.

### Textbook exercise

Do exercise 4.19.

### Verify the narrow-band modulation approximation

Consider a periodic square signal as in Fig 2.27 and verify that the difference between the phase modulation and its narrow-band modulation is decreasing with the modulation index. How can you approximatively compute the difference between these two signals? Repeat the same calculations for the case of frequency modulation.

### Verify Carson's rule

Consider again the square signal in Fig 2.27 and verify that Carson's rule by calculating the effective bandwidth for different modulations indexes or through numerical simulations. Repeat the same calculations for the case of frequency modulation. How does the effective bandwidth changes between phase and frequency modulation.