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**Homework 2: Due at start of class on Nov. 11, Friday**

## Problems From Text

1. 4.1. In addition, calculate the magnitude and phase response from the Fourier Transform, and show your steps.
2. 4.18
3. 4.20
4. 5.6 (use AM.m)
5. 5.12
6. 5.17a
7. Prove the cosine modulation frequency shift property (A.33).

## Matlab Problem

**Injection to Intermediate Frequency.** A transmitter uses standard AM with suppressed carrier. The carrier frequency is 10 kHz, and the bandwidth of the desired signal is 50 Hz. We wish to downconvert this message to an intermediate frequency of 500 Hz.

1. Download the MATLAB file `hw2sig1.mat` containing the received data vector `rec` from the course website. Use the command:  

```
load hw2sig1;
```

to load the data into MATLAB.  
The sampling frequency of the received signal is  $f_s = 50$  kHz. Use both low-side injection and high-side injection to downconvert the signal to the intermediate frequency. Provide your code, as well as frequency-domain plots of the signal at the intermediate frequency.
2. Download the MATLAB file `hw2sig2.mat` and load into MATLAB (use `load hw2sig2`). The sampling frequency here is again  $f_s = 50$  kHz. This signal contains the same message as well as another undesired message at another carrier frequency. Again, downconvert the desired signal to the intermediate frequency using both low-side and high-side injection. Did the undesired signal interfere with the desired message at the intermediate frequency? If so, explain why.
3. Create appropriate bandpass filters to apply before downconverting the signal such that the undesired signal will not interfere.