1. A message signal is \( m(t) = 15\cos(2\pi t) \) volts and the carrier wave is \( c(t) = 40\cos(100\pi t) \) volts, the percent modulation (sometimes called modulation index or modulation factor) is 80%  
   a. Plot the RF signal in the time domain to scale.  
   b. What is the total RF transmitted power assume a 100 ohm load.  
   c. What is the RF bandwidth?  
   d. Plot the power spectral density of the RF signal signal.

2. A message signal is \( m(t) = \frac{t}{1+t^2} \) for the following AM percent modulations plot the RF signal  
   a. 40%  
   b. 90%  
   c. 120%

3. 3.21

4. 3.25

5. 3.28

6. Let \( s(t) \) be an DSB-LC (AM) signal. The unmodulated transmitted power is 6 KW. The message signal is \( m(t) = \cos(2\pi f_m t) \). The modulated transmitted power is 8 KW.  
   a. Find the corresponding \( A_c \) and \( k_a \) in equation 3.2.  
   b. What is the modulation factor?  
   c. What is the power efficiency?  
   d. What is the RF bandwidth?

7. Given a baseband bandwidth of 90kHz for signals \( x_1(t), x_2(t), x_3(t) \ldots x_N(t) \), i.e., \( B_i=90\text{kHz} \) for \( i=1\ldots N \). These signals are modulated using DSB-SC modulation. The modulated DSB-SC signals are frequency division multiplexed using a shared assigned RF spectrum of 20MHz.  
   a. Assuming no guard band find \( N \).  
   b. Assuming a 20 KHz guard band find \( N \).

8. An DSB-LC RF signal is plotted below. What is the modulation index (modulation factor)?