1. Determine whether or not each of the following signals is periodic. If a signal is periodic, determine its fundamental period.
   a. \( x(t) = A \cos(2t + \theta) \)
   b. \( x(t) = 2.5e^{-2.5t} \cos(\pi/4t) \)
   c. \( x(t) = \sin^2 t - 1/2 \) (Hint: use a trigonometric identity)
   d. \( x(t) = \sin \left( \frac{2\pi}{3} t \right) + \cos \left( \frac{3\pi}{2} t \right) \)
   e. \( x(t) = A_1 \sin(2t + \theta_1) + A_2 \sin(\sqrt{50}t + \theta_2) \)

2. Let \( \{z_t\}, t = 0, \pm 1, \ldots \) be independent random variables, each with mean zero and variance \( \sigma^2 \). Determine whether or not each of the following processes are stationary.
   a. \( x_t = \sum_{j=1}^{t} Z_j \) (called random walk) with the autocorrelation function \( R_{xx}(t, t+h) = \sum_{j=1}^{t} \sigma_j^2 \).
   b. \( x_t = z_1 \cos(ct) + z_2 \sin(ct) \) (where \( c \) is a constant) with the autocorrelation function \( R_{xx}(t, t+h) = \sigma^2 \cos(ch) \).

3. Answer the following questions based on the Matlab generated Histogram.
   Note: the wind speed (mph) time series at 70 ft from the data set “m26r6ws.mat” is used. The distribution of the data among bins with centers specified by 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35 are 0, 27, 228, 807, 1363, 1512, 1570, 1128, 678 274, 31, respectively.

   a. roughly what percentage of the wind speed is below 20 mph?
   b. roughly what percentage of the wind speed is above 28 mph?
   c. roughly, 38.8% of the wind speed is above what value?
   d. roughly, 89% of the wind speed is below what value?

4. Given a set of data: 12, 15, 23, 29, 19, 22, 21, 20, 15, 25, 17 (Note: you can use any methods to solve the problem).
   a. Fine the mean
   b. Find the variance/standard deviation
   c. Find the five-number summary
   d. Construct the Boxplot
   e. What is the distribution shape of the data?
Matlab Assignment

1. What is the output (or result) of each of the following Matlab statements.
   (a) \( x = 0:5 \)  
   (b) \( z = 12:-4:1 \) 
   (c) \( y = \text{linspace}(1,2,4) \) 
   (d) \( x = [1 2 3]'; \ y = [1 2 3]; \ z = x \ast y \) 
   (e) \( x = [1 2 3]; \ y = [1 2 3]; \ z = [x; y] \)

2. Give the result of the following operations
   (a) \([1,2,3,4].^2\)
   (b) \([1,2,3,4]./[3,4,5,6]\)
   (c) \(2.^[1,2,3,4]\)
   (d) \([1,2,3,4].^[4,3,2,1]\)

3. What is the output of the following matlab commands? (either draw a sketch or print out a hard copy)
   
   >> \text{x = linspace(0,2*\pi)}; 
   >> subplot(2,2,1); 
   >> \text{plot(x,\text{sin(x))}; \text{axis([0 2*pi -1.5 1.5])}; \text{title('sin(x)')}}; 
   >> subplot(2,2,2); 
   >> \text{plot(x,\text{sin(2*x))}; \text{axis([0 2*pi -1.5 1.5])}; \text{title('sin(2x)')}}; 
   >> subplot(2,2,3); 
   >> \text{plot(x,\text{sin(3*x))}; \text{axis([0 2*pi -1.5 1.5])}; \text{title('sin(3x)')}}; 
   >> subplot(2,2,4); 
   >> \text{plot(x,\text{sin(4*x))}; \text{axis([0 2*pi -1.5 1.5])}; \text{title('sin(4x)')}};
4. What is the output of the following matlab commands? (either draw a sketch or print out a hard copy)

```matlab
>> x = linspace(0,2*pi);
>> x1 = linspace(0,2*pi,30);
>> plot(x,sin(x),'b');
>> hold on
>> plot(x1,sin(2*x1),'or');
>> legend('sin(x)','sin(2 x)')
>> hold off
```