Reading Assignments:

Lectures #1-2 & PS#1: Chapter 1 of Oppenheim and Willsky (O&W), including review of complex numbers (see p. 71)
Lectures #3-4 & PS#2: Chapter 2 of Oppenheim and Willsky (O&W)

Exercise for home study (not to be turned in, although we will provide solutions):

(E1) Problem 1.54

Problems to be turned in:

Problem 1 Answer the questions asked in Problem 1.49 of O&W for each of the following complex numbers:
   
   (a) \((\sqrt{3} + j)^5e^{-j\pi/3}\)

Problem 2 Consider the signal \(x(t)\) depicted in Figure P1.21 on p.60 of O&W. Sketch and carefully label each of the following two signals:

   (a) \(x(1 - \frac{t}{3})\)
   (b) \(x(t - 2)[\delta(t - \frac{1}{2}) + u(3 - t)]\)

Problem 3 Consider the signal \(x[n]\) depicted in Figure P1.22 on p.60 of O&W. Sketch and carefully label each of the following two signals:

   (a) \(x[2 - n]\)
   (b) \(x[2n + 1]\)
Problem 4  Determine and sketch the even and odd part of the following signal. Label your sketch carefully.

\[
x(t)
\]

Problem 5  Determine whether or not each of the following signal is periodic. If the signal is periodic, determine its fundamental period.

(a) \( x(t) = [\sin(4t - 1)]^2 \)
(b) \( x[n] = \cos(4n + \pi/4) \)
(c) \( x[n] = (-1)^n \cos(2\pi n/7) \)

Problem 6  Answer the same set of system property questions as described at the bottom of page 61 of O&W (i.e., determine which of the listed properties hold) for each of the following systems:

(a) \( y(t) = x(t + 3) - x(1 - t) \)
(b) \( y[n] = \begin{cases} (-1)^n x[n], & x[n] \geq 0 \\ 2x[n], & x[n] < 0 \end{cases} \)
(c) \( y[n] = \sum_{k=n}^{\infty} x[k] \)
Problem 7  Consider an LTI system whose response the to signal \( x_1(t) \) is the signal \( y_1(t) \), where these signals are depicted below:

\[
\begin{align*}
\text{\( x_1(t) \)} & \quad & \text{\( y_1(t) \)} \\
\begin{cases}
2 & t < 0 \\
1 & 0 \leq t < 1 \\
1 & t \geq 1
\end{cases} & & \begin{cases}
1 & t < 0 \\
-1 & 0 \leq t < 1 \\
1 & t \geq 1
\end{cases}
\end{align*}
\]

Determine and provide a labeled sketch of the response to the input \( x_2(t) \) depicted below.

\[
\begin{align*}
\text{\( x_2(t) \)} & \\
\begin{cases}
2 & t < 0 \\
1 & 0 \leq t < 2 \\
2 & t \geq 2
\end{cases}
\end{align*}
\]

The following problem is from *Computer Explorations in Signals and Systems Using MATLAB Second edition* by Buck, Daniel, and Singer (BDS). You may want to look at BDS Section 1.1 to be familiar with Matlab. Please submit your code as a part of your solution.

Problem 8  BDS Section 1.3

Reminder: The first 20 problems in each chapter of O&W have answers included at the end of the text. Consider using these for additional practice, either now or as you study for tests.