# Signals and Systems Review

Resource: Oppenheim, Willsky, Signals and Systems 2<sup>nd</sup> Edition, Pearson.

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## 1. Convolution

For quick reference, see Eq. (2.39), (2.40).
More Details:
 (1) Convolution sum (for discrete-time system)
Readings: S&S Ch2.1.2 The Discrete-Time Unit Impulse Response and the Convolution-sum
Representation of LTI Systems, Content around Eq. (2.6), (2.7), (2.39)
Examples: S&S Example 2.1, 2.2 (Same problem solved in different ways)

(2) Convolution integral (for continuous-time system) **Readings:** S&S Ch2.2.2 The Continuous-Time Unit Impulse Response and the Convolution Integral Representation of LTI Systems, Content around Eq. (2.33), (2.34), (2.40) **Examples:** S&S Example 2.6, 2.7

#### 2. System Functions/Impulse Response

(1) Impulse Response To be brief, impulse response the response of an LTI system when the input is  $\delta[n]$  (for discrete-time LTI systems) or  $\delta(t)$  (for continuous-time LTI systems). **Readings:** S&S Ch2.1.2 The Discrete-Time Unit Impulse Response and the Convolution-sum Representation of LTI Systems, Content around Eq. (2.5) Ch2.2.2 The Continuous-Time Unit Impulse Response and the Convolution Integral Representation of LTI Systems, Content around Eq. (2.32)

(2) System functions
H(s) (for continuous-time systems) or
H(z) (for discrete-time systems)
Readings: S&S Ch3.8 Fourier Series and LTI Systems, contents around Eq. (3.119),
(3.120)

#### 3. Laplace transform and properties

## 4. Frequency response/Bode plots

(1) Frequency Response  $H(j\omega)$  - for Continuous-time Systems  $H(e^{j\omega})$  - for Discrete-time Systems

#### 5. Pole-zero plots

(1) Continuous-time Systems
Readings: S&S Ch9.1 The Laplace transform, contents after Eq. (9.31) (for a quick
reference, just look at result of Example 9.5 and Figure 9.3)
Examples: S&S Example 9.5 & Figure 9.3

(2) Discrete-time Systems
Readings: This topic is covered in class (DSP Ch3 The Z-Transform).
 You could also read S&S Chapter 10 The Z-Transform
Examples: S&S Example 10.1 & Figure 10.2
 Example 10.2 & Figure 10.3