ELEC 309
Signals and Systems
Homework 4 Assignment

Time-Domain Analysis of LTI Systems

1. A continuous-time system is described by the input-output equation

$$5\frac{dy(t)}{dt} + 10y(t) = 2x(t)$$

with initial condition $y(0) = 1$ and input $x(t) = u(t)$.
Using the classical approach to solving LCCDEs:

(a) Determine the output $y(t)$ of the system.
(b) Determine the zero-input output $y_{zi}(t)$ of the system.
(c) Determine the zero-state output $y_{zs}(t)$ of the system.
(d) If $y(0) = 0$, determine the impulse response $h(t)$ of the system.
(e) If $y(0) = 0$, determine the step response $y_s(t)$ of the system.

2. A discrete-time system is described by the input-output equation

$$y[n] - \frac{1}{2}y[n-1] = 2x[n]$$

with initial condition $y[-1] = 3$ and input $x[n] = \left(-\frac{1}{2}\right)^n u[n]$.
Using the classical approach to solving LCCDEs:

(a) Determine the output $y[n]$ of the system.
(b) Determine the zero-input output $y_{zi}[n]$ of the system.
(c) Determine the zero-state output $y_{zs}[n]$ of the system.
(d) If $y[-1] = 0$, determine the impulse response $h[n]$ of the system.
(e) If $y[-1] = 0$, determine the step response $y_s[n]$ of the system.