Reading: Class notes.

Problems:

1. Consider the following impulse response. Using the method of your choice, verify if the system is BIBO stable.

1. $h[n] = \{\underline{1}, -2, 1\}$
2. $h[n] = 2^{-n}u_0[n]$
3. $h[n] = (1.1)^n u_0[n]$
4. $h[n] = 2^n u_0[n] - 2^n u_0[n-10]$
5. $h(t) = u_0(t) - u_0(t-1)$
6. $h(t) = e^{-t}u_0(t)$
7. $h(t) = e^{t}u_0(t)$
8. $h(t) = e^{t}u_0(t) - e^{-t}u_0(t)$

2. Consider the following discrete-time system

$$y[n] = ay[n-1] - u[n]$$

where a is a real number. Determine the range of a for which the system is BIBO. Do this using both

1. the test for impulse response $h[n]$.
2. the test for transfer function $H(z)$.

3. Consider the following continuous-time system

$$\frac{\mathrm{d}y}{\mathrm{d}t} + ay = u$$

where a is a real number. Obtain the range of a for which the system is BIBO. Do this using both

1. the test for impulse response $h(t)$.
2. the test for transfer function $H(s)$.

4. Draw the pole-zero diagram for the following systems:

1. $h(t) = u_0(t)$
2. $h(t) = e^{t}u_0(t)$
3. $h[n] = \{-\underline{1}, 2, 1\}$
4. $h[n] = \{2, \underline{2}, 1\}$
5. $h[n] = \{1, 2, \underline{1}\}$
6. $H(s) = \frac{(s-1)}{s^2+5s+6}$
7. $H(z) = \frac{(z-1)}{z^2+5z+6}$

Indicate if the system is BIBO stable. For 3, 4, and 5, also determine if the system is causal.