ENGR 4333/5333: Digital Signal Processing

HW 9: Ch 7

1) Using the definition, find the bilateral z-transforms, including ROCs, of

(a) $x_a[n] = (0.8)^n u[n] + 2^n u[-n-1]$ **(b)** $x_b[n] = 2^n u[n] - 3^n u[-n-1]$ **(c)** $x_c[n] = (0.5)^{|n|}$

2) Using the definition, find the unilateral z-transforms of

(a) $x_a[n] = u[n-m],\ m > 0$ **(h)** $x_b[n] = n\gamma^n u[n]$

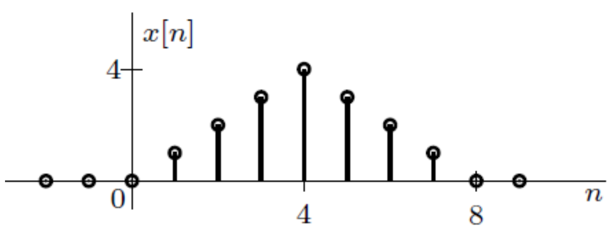
3) Find all possible inverse bilateral z-transforms of

$$\text{(a)}\ X_a(z) = \frac{z(z+1)}{(z-.5)(z+2)} \qquad \text{(b)}\ X_b(z) = \frac{(z+1)(z-1)}{(z^2+1)}$$

4) Find the inverse unilateral z-transforms of

$$\text{(a)}\ X_a(z) = \frac{z(z-4)}{z^2-5z+6} \quad \text{(b)}\ X_b(z) = \frac{z-4}{z^2-5z+6} \quad \text{(c)}\ X_c(z) = \frac{z(-5z+22)}{(z+1)(z-2)^2} \quad \text{(d)}\ X_d(z) = \frac{z(z-2)}{z^2-z+1}$$

5) Find the z-transforms of the signal shown below



6) An LTID system is described as $2y[n+2] - 3y[n+1] + y[n] = 4x[n+2] - 3x[n+1]$, with $y[-1] = 0$, $y[-2] = 1$, and input $x[n] = (4)^{-n}u[n]$.

(a) Determine the total response $y[n]$.

(b) Determine the zero-input and zero-state components of the response.

(c) Determine the transient and steady state components of the response.

7) A causal controllable and observable, LTID system has transfer function $H(z) = \dfrac{z}{(z+0.2)(z-0.8)}$

(a) Is this system stable? Explain.

(b) Find the zero-state response to input $x[n] = e^{(n+1)}u[n]$.

(c) Write the difference equation relating the output $y[n]$ to input $x[n]$.

(d) Determine the system's unit impulse response $h[n]$.